TRANSFORuM Roadmap Urban Transport

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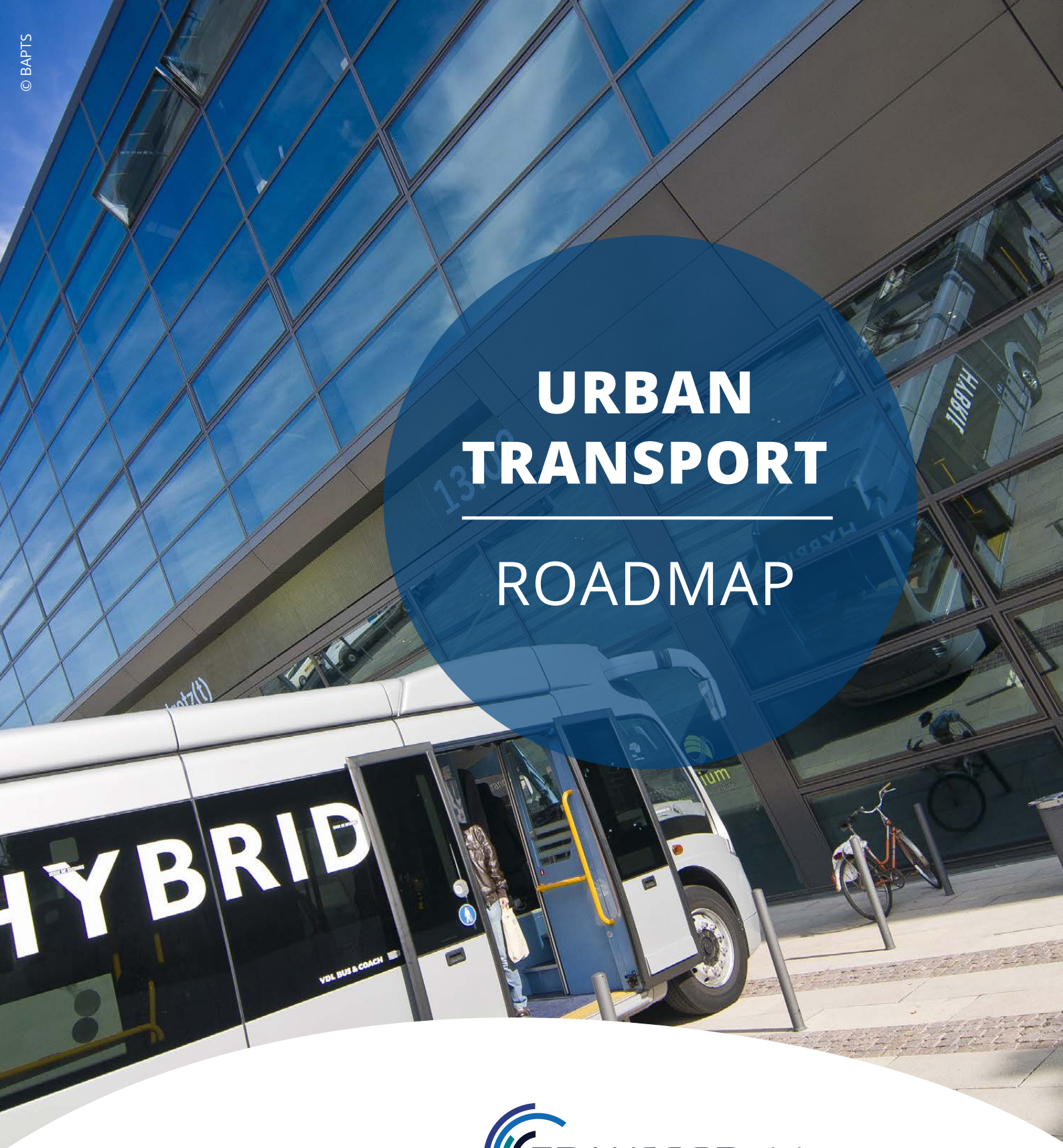

URBAN TRANSPORT

ROADMAP

TRANSFORUM TRANSPORT 2050

This project is co-funded by the European Union

SEVENTH FRAMEWORK PROGRAMME

ROADMAP towards goal 1 of the White Paper on Transport:
»Halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030.«

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The TRANSFORuM consortium:

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THE CONVERSATION DOES **NOT** STOP ON 8 DECEMBER 2014!

The comments we receive at the conference on 8 December 2014 will still be considered in the condensed version of the TRANSFORuM Roadmaps and for the Strategic Outlook document. We will also compile the essence of the Brussels discussions on our project website.

The conversation about the revision of the White Paper and the best ways to implement its goals will also continue on the TRANSFORuM website, where we provide an online forum for all your thoughts, comments, criticisms and suggestions. Keep the discussion alive.

www.transforum-project.eu

GENERAL INFORMATION

The present document is the Roadmap 2.0 on Urban Transport of the FP7 project TRANSFORuM. This roadmap is one element of the formal Deliverable 6.2 "Consolidated roadmaps and recommendations to reach selected EC 2011 WP goals".

More information about the project can be found at www.transforum-project.eu

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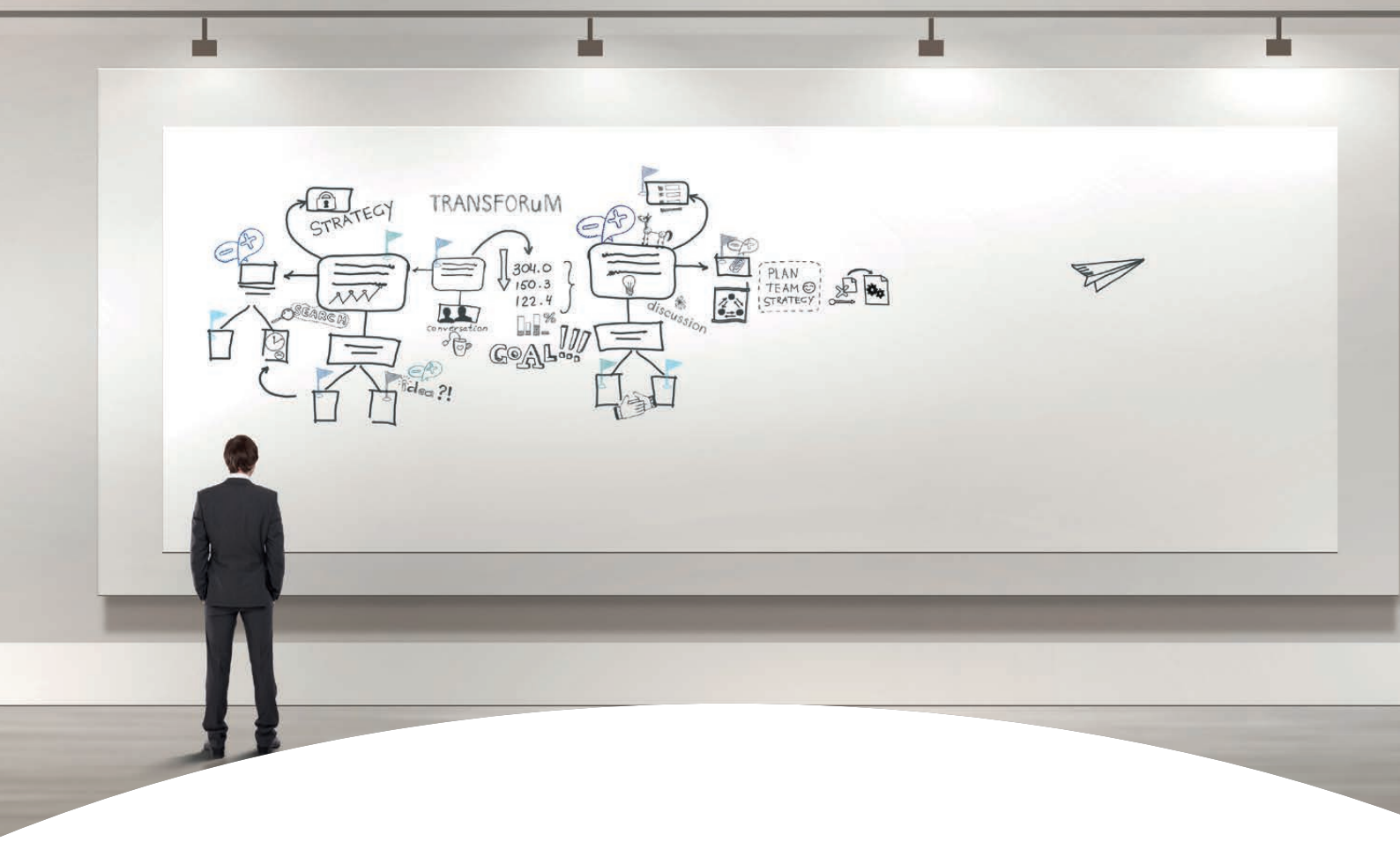
BRT	Bus rapid transit
CLCS	City logistics service centre
CNG	Compressed natural gas
EFV	Electric freight vehicle
EIB	European Investment Bank
EV	Electric vehicle
EVSE	Electric vehicle supply equipment
FCV	Fuel cell vehicle
GHG	Greenhouse gas
HEV	Hybrid electric vehicle
ICE	Internal combustion engine
ICT	Information and communications technology
ILUC	Indirect land use change
ITS	Intelligent transport systems
LEZ	Low emission zone
LPG	Liquefied petroleum gas
MIMP	Multimodal information, management and payment
PHEV	Plug-in hybrid electric vehicle
PM	Particulate matter
PPP	Public-private partnership
R&D	Research and development
RFSC	(European) Reference Framework for Sustainable Cities
RME	Rapeseed methyl ester
SUMP	Sustainable urban mobility plan
UCC	Urban consolidation centre
UEMI	Urban Electric Mobility Initiative
ULEV	Ultra low emission vehicle
ULEZ	Ultra low emission zone
UMO	Urban Mobility Observatory
WHO	World Health Organisation
ZEV	Zero emission vehicle



1 Information about the TRANSFORuM project

Generally speaking, the FP7 project TRANSFORuM contributes to the transformation of the European transport system towards more competitiveness and resource efficiency. It has done so by engaging key stakeholders in carefully moderated forum activities and through other consultation measures in order to identify their views about the related challenges, barriers, trends, opportunities and win-win potentials. TRANSFORuM thus facilitated a discussion forum of relevant actors and stakeholders about the best ways to reach four key goals of the 2011 European White Paper on Transport:

- **Clean urban transport and CO_2-free city logistics (goal 1)**
- Shift of road freight to rail and waterborne transport (goal 3)
- Complete and maintain the European high-speed rail network (goal 4)
- European multimodal transport information, management and payment (MIMP) system (goal 8)

TRANSFORuM's underlying assumption was that policymaking should be based on an in-depth understanding of all stakeholders' positions and that coordinated action among them is more effective than any solo attempts. The TRANSFORuM consultation process was therefore designed to elicit these views and to facilitate the emergence of synergy ideas.

The concrete conversations with and among stakeholders were conducted through many direct interviews, 130 responses to our online survey, via various social media channels and the feedback function of our project website. Most importantly, though, TRANSFORuM organised 10 face-to-face workshops in 10 different European countries – at four of which urban mobility was addressed (see overleaf).

We paid careful attention to ensure a balanced representation of all types of stakeholders: Men and women, established large companies and innovative start-ups, representatives from all corners of Europe, suppliers and users, hardware and software companies etc. This selection process was based on TRANSFORuM's first official deliverable ("Shaping the TRANSFORuM Network" – available on our website), which spells out the criteria that guides our stakehold-

er selection. To ensure the complete transparency of this process we made the list of attendees of our events always publicly available on our website. Our participants included representatives of city administrations, producers and developers of vehicles and energy technologies, transport operators and mobility service providers, businesses and experts involved in freight and urban logistic services, representatives of citizen organisations, think tanks and other NGOs and members of national and European programmes and platforms supporting clean urban mobility.

This roadmap is primarily based on the stakeholder debates at the following TRANSFORuM workshops (similar workshops were conducted for the other three goals):

- Two-day workshop in Gdansk (June 2013) to identify key policies, actors, funding mechanisms and trends as well as barriers, challenges and ways to overcome them;
- Two-day workshop in Oslo (October 2013) on good practice and learning and sharing processes, including a site visit to see Oslo's maturing electric vehicle (EV) infrastructure;
- Two-day workshop in Vienna (January 2014) with special emphasis on cross-cutting issues between the 4 TRANSFORuM areas. Presentation and discussion of a preliminary urban roadmap 1.0;
- Two-day workshop in Copenhagen (May 2014) to discuss key challenges and building blocks for the roadmap, including a trip around the city using the newly-established e-bike scheme.

The roadmap was carefully reviewed by two external experts ensuring a consistency and quality check and allowing for some further improvements.

The document has the following structure:

Chapter 2 introduces the urban transport goal in more detail and explains how stakeholders and the TRANSFORuM consortium have interpreted it.

Chapter 3 outlines the context in which a roadmap is to be developed in terms of existing trends, variations in conditions and governance arrangements across Europe and barriers for implementation.

Chapter 4 presents the basic strategic building blocks for a roadmap, in terms of the ways in which urban transport can be influenced and transformed in order to realise the goal.

Chapter 5 highlights so-called "enabling mechanisms" and factors that will be needed to allow the building blocks to be activated and connected in new ways, reaching towards the very ambitious White Paper goal.

Chapter 6 illustrates three different types of pathways that cities could embark on to reach towards the White Paper goal – by way of speculative 'roadmaps' for fictive cities.

Chapter 7 summarises the observations, propositions and ideas of the TRANSFORuM process and presents the European level roadmap itself.

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2 The White Paper goal on Urban Mobility

TRANSFORuM's Thematic Group on Urban Mobility deals with goal no. 1 from the European Commission's 2011 Transport White Paper:

Halve the use of 'conventionally-fuelled' cars in urban transport by 2030; phase them out in cities by 2050; achieve essentially CO_2-free city logistics in major urban centres by 2030

This goal is ambitious. In fact, it sets an **unprecedented level of ambition** for policy driven change in urban mobility in Europe; no goal of this kind has been formulated on a continental scale before.

Yet, the spirit of the goal corresponds well to emerging visions and on-going efforts already underway in many cities in Europe. It also chimes with policies formulated by stakeholders, governments and the European Community itself in areas such as transport, energy, climate change, innovation and technology, urban planning, health and the environment. For example, European transport ministers in their recent response to the Commission's so-called "**Urban Mobility Package**"[1] expressed support for stronger efforts and more cooperation to tackle urban mobility-related problems and to improve quality of life in our cities.

However, existing commitments and policies are far from ensuring that the White Paper goal will be accomplished. In fact, it has so far been quite unclear how urban transport stakeholders and policymakers across Europe view this particular goal and how they consider it could be fulfilled in practice, if at all.

This has been part of TRANSFORuM's mission to uncover.

TRANSFORuM's stakeholder consultations led to the realisation that a roadmap – in the sense of a strategy with clear answers to the question *"Who has to do what by when"* – should take its starting point on the following observations and propositions:

1 European Commission (2013). Together towards competitive and resource-efficient urban mobility. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels, 17.12.2013. COM(2013) 913 final. ec.europa.eu/transport/themes/urban/doc/ump/com%282013%29913_en.pdf

- The specific urban mobility goal cannot stand alone but must be seen as an element of a wider approach towards sustainable urban mobility in Europe;
- The adoption of non-conventionally-fuelled vehicles and CO_2-free logistics in European cities is currently moving too slowly for the goal to be reached "automatically";
- Efforts to influence the volume of car and truck traffic and to provide convenient alternatives are at least as important for European cities as is the substitution of conventionally-fuelled vehicles with alternatively-propelled ones;
- Significant additional actions at all political levels are needed and this has to include the exploitation of opportunities to use conducive technologies, promoting relevant behaviours and developing suitable governance arrangements;
- Political visions and leadership at city, national and European levels have to guide these transitions; the goal cannot be fulfilled as a master plan with a top-down approach. Contexts and conditions vary in time and space across Europe and one size does not fit all.

These key observations and propositions extracted from stakeholder consultations set the tone for the document, which will elaborate and outline a roadmap that is intended to help propel us towards the dual White Paper targets on clean urban mobility and logistics.

2.1 The "spirit" of the White Paper goal on urban mobility

The White Paper goal on urban mobility leaves quite a degree of interpretation open, which necessitates consideration of its context and underlying rationales.

First it can be noted that the goal on clean urban mobility is placed under the headline ***"Developing and deploying new and sustainable fuels and propulsion systems."*** This, and some terminology used in the goal (especially the focus on 'conventionally-fuelled' cars), could suggest that the path to clean urban mobility is expected to focus mainly on advances in vehicle and fuel technology.

Technological transformation, however, is not the only possible solution to reduce the ***use*** of conventionally-fuelled vehicles or to achieve CO_2-free city logistics, as are the core formulations of the goal. The emphasis on use and service in the goal clearly invites a broader approach. In this regard, it is also important to consider the underlying aims behind the goal as they are formulated directly in the White Paper, which include the following:

- To reduce CO_2 emissions from urban transport as part of Europe's contribution to avoid dangerous interference with the global climate system;
- To reduce the oil dependency of Europe's transport sector and reduce an oil import bill of currently around €210 billion every year;
- To significantly reduce the emissions of pollutants (particulate matter (PM), NOx) and noise and thereby improve the quality of life in European cities;
- To support the introduction of new technologies and the creation of lead markets for innovative vehicle concepts, thus improving the global competitiveness of the European transport sector.

The specific goal may then be seen not as an end in itself, but as a means to obtain those broader ends.

Furthermore, according to the White Paper, transport goals are to be fulfilled without sacrificing the efficiency of the transport system and without 'curbing' mobility, as it is phrased. As such, the official subtitle of the White Paper is ***"Towards a competitive and resource efficient transport system"***.

Hence it must be assumed that the key to reaching the goal is not to adopt a single solution but to exploit the various available ways to improve efficiency, limit oil dependence and reduce negative impacts while maintaining services offered by mobility in a suitable way.

The goal specifies some near-quantitative figures ***("halving … by 2030"; "phasing out … by 2050"; "essentially CO_2-free")*** and target years (2030; 2050), which provide clear signposts for the interpretation of the goal and for the setting of benchmarks.

The central term ***"conventionally-fuelled vehicles"*** seems somewhat ambiguous. It is further specified in a footnote to include "vehicles using non-hybrid, internal combustion engines (ICE)". This specification would clearly target petrol and diesel cars as those whose use should be halved and phased out, while notably accepting that all hybrid cars would go into the permissible category, regardless of type and fuel. It is less obvious to what extent ICE's using alternative fuels (e.g. biodiesel, compressed natural gas (CNG), liquefied petroleum gas (LPG)) are to be counted in or out.

The term "essentially CO_2-free city logistics" seems even more under-defined, not so much in terms of the target value (near zero), but more in the scope of the term 'city logistics' in major urban centres.

Would this refer to all movement of freight in 'major urban centres' or only that the centres of major urban areas must provide some level of city logistic service that is 'essentially CO_2-free' before the target year?

Finally it can be noted that the goal uses various spatial delimitations; 'cities', 'urban areas', and 'major urban centres', but does not itself offer more specific definitions of these terms.[2]

2.2 Embracing the goal

The European Commission has formulated the goal, but its fulfilment will require principal support as well as considerable action from a continent of cities.

A first precondition would therefore be to ensure that the goal is being acknowledged, recognised, appreciated and eventually adopted in some form by those cities and other urban transport stakeholders whose actions it is meant to inspire.

TRANSFORuM represents one arena for such a process. At the outset the TRANSFORuM consortium saw it as important not to embrace the goal with mindless 'canonisation' in mind, but rather to invite critical appreciation and reflection allowing different interpretations as well as possible ambiguities and limitations to be brought into light. Such an approach is believed to increase rather than lower the chances for the goal to eventually becoming accepted and operative.

However, an objective with too many different interpretations may no longer be able to perform its intended work as an effective, shared goal. A popular management philosophy stipulates that effective and useful goals need to be 'SMART' (Specific, Measurable, Attainable, Relevant, Timely). TRANSFORUM has been aware that forming a roadmap for an unclear goal may be an impossible task and that some degree of common understanding would be desirable.

The first step in the TRANSFORuM dialogues was therefore to ask stakeholders to embrace the goal by discussing its relevance and achievability, and to consider to what extent it may need more flexibility, or more rigour to serve well as a basis for crafting a European-wide roadmap.

2.3 Stakeholders' perspectives of the goal

Nearly all stakeholders participating in TRANSFORuM workshops and surveys stated that they were aware of the White Paper goal. The feedback we got from attendees of the OECD's International Transport Forum summit[3] 2014 are somewhat different: Only 16 out of 24 respondents indicated that they were aware of the goal and based on many other conversations it seems safe to assume that the awareness of the White Paper among the community of stakeholders is still limited. In any case, most of our workshop attendees at least stated that the goal is relevant to their daily work. Moreover, most of them considered the goal achievable, at least in principle. But action would be needed very soon if it is to be reached in time. After all, the 2030 target is only 15 years away. Many new vehicles sold in the next few years will, for example, still be in use by then.

Stakeholder views differed with regards to whether the passenger or the freight target is more achievable; on average, the latter is seen as more difficult to reach

2 The joint EC/OECD typology of cities was released after the publication of the White Paper and does not even include all categories used in the White Paper, such as "major urban centres"

3 TRANSFORuM had a stand at the ITF summit to elicit stakeholders' views. See www.transforum-project.eu/events/itf-leipzig.html for further details, including stakeholders' views on the goal's desirability and feasibility

than the former. Also the perceived importance of these two targets varies. Some statements were made indicating that the logistics community does not think a EU target is so important, compared to what cities do. Almost all stakeholders agreed, however, that the achievability of the goal and its targets depends to a large degree on the precise definitions of key terms.

Some stakeholders emphasised that the target to halve the use of conventionally-fuelled cars is more of an instrument, a means, or a signal towards the general ends, as one among several different tools to tackle the challenges in urban mobility and to reach the underlying 'real' goals. The focus should be on how to reach those underlying goals and aims in the best way, rather than on only one of the 'means'.

An important outcome of the stakeholder consultations concerns the strategic context for interpreting the goal. There was wide support of the view that the goal should not be pursued only with a 'technological fix' in mind (simply replacing all 'conventionally-fuelled cars with non-conventionally-fuelled ones) but should embrace a wider strategy, where the use of vehicles and the organisation of mobility and logistics are taken into account. The technological aspect of the goal should not be treated as an isolated endeavour but as part of wider efforts to promote sustainable and resource efficient urban transport.

On a more technical level, stakeholders expressed concerns about the declaration of hybrid cars as "non-conventionally-fuelled". The group of hybrids is diverse in terms of technical design and independence from fossil fuel. So-called 'mild hybrids' may, for example, not even have an alternative fuel source. Hybrids in general are expected to become so widely adopted via normal market mechanisms that counting them all in towards fulfilling the goal could dilute the effects in terms of the subsequent environmental results.

It was most widely agreed that first and foremost different actors engaged in urban transport need to cooperate more in order to reach a genuine shift towards sustainable urbanism. The goal must be seen in this context, that is, as a trigger and focus of productive cross-cutting dialogue among all kinds of stakeholders.

With regard to the key terms 'cities', 'urban area' and 'major urban centres', stakeholder consultations did not lead to agreement on more specific distinctions. Some stakeholders find this important, especially if the goal is to be monitored and enforced in some way, while others are not particularly concerned. One point made repeatedly by many stakeholders was, however, to focus not only on core urban areas because much larger geographical areas should be the unit of analysis and action due to contemporary commuting patterns and the catchment areas of urban in- and out-flows.

2.4 TRANSFORuM's interpretations of the goal

Based on the stakeholder views, the TRANSFORuM consortium interprets the urban mobility goal more as an expression of a bold ambition for the current transport system, with a clear direction for change, than as a mechanical target to be pursued blindly by everybody. Even if it is useful to have a clear and measurable goal, this must not lead to 'tunnel vision', or to the assumption that the exact same numerical targets would necessarily apply everywhere. The goal needs to be adopted by stakeholders as one among other goals in their general strategies for sustainable, competitive and resource efficient urban mobility.

TRANSFORuM nevertheless finds there is a basis for appreciating and embracing the goal's specific relevance among wider stakeholder groups and we confirm it as the beacon for the proposed roadmap. All European cities and Member States as well as the EU as a whole should indeed be able to demonstrate progress towards this goal or even to exceed it (as appropriate and feasible).

To that effect the goal should be further operationalised and monitored with the use of indicators and benchmarks applied at the urban as well as at the European level. Specifications and methodologies to make the goal more operational and possible to monitor should be developed and supported by the European Commission, as part of wider observatory activities.

The stakeholders we listened to indicated clearly that the goal must not be seen as a call for a technological fix but as stimulus to pursue the final destination on multiple routes in parallel. Three of them emerged as particularly important and therefore the structure this roadmap sees these as distinct but equally valid fields of actions or – as we explain in chapter 4 – as 'building blocks' of the entire set of possible and recommended measures. These are:

- Technological substitution of conventional passenger cars and fuels;
- Reduced use of private passenger cars for transport combined with an increase in public transport usage and non-motorised forms of travel;
- Increased utilisation of low carbon city logistics technologies and practices.

The European Commission should also ensure continued efforts to engage European cities, stakeholders and Member States in a dialogue urging them to reflect and embrace appropriate adaptations of the goal as part of their wider strategies for urban mobility. The goal should be revisited and possibly revised in due course. This is in line with the planned forthcoming review of the Transport White Paper, which Maroš Šefčovič announced as a priority during the hearing of his candidacy as EU Commissioner in front of the European Parliament. Also the new EU Commissioner for Transport, Violeta Bulc, pointed in this direction during her hearing. In her response she also implied that the White Paper remains highly valid and needs to be filled with life through "a constant collaboration and constant communication with those that share the vision of the future.[4]"

4 Violeta Bulc's hearing by the European Parliament on 20 October 2014 – recording available at: audiovisual.europarl.europa.eu/Assetdetail.aspx?id=6c999132-bb77-4210-bc5f-a3ca0125013e. Quote at 3:34 minutes

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BERLINER CITY TOUR

3 Conditions for change

What are the conditions that the European cities face to attain the urban goal? The conditions differ as regards to the current situation in each city and depending on the approaches that they adopt. For example whether they choose to focus on technological substitution, change in transport behaviour within passenger transport and/or increased utilisation of low carbon city logistics.

3.1 Mapping the current situation

3.1.1 Diversity of cities

According to a recent definition by Djikstra and Poelman (2010) there are 806 cities in the EU with an urban centre of at least 50,000 inhabitants. These cities host 40% of the EU population, with towns and suburbs covering another 30% of the population. So the goal is of direct relevance to a very large proportion of the European population. The cities differ considerably as regards to size and density. The largest European cities are London and Paris, but the majority of city populations live in much smaller conurbations.

The stakeholders, who have participated in the TRANSFORuM activities or have been interviewed, emphasise that a uniform set of measures for all European cities is not the way forward. Different conditions, opportunities and cultures imply that every city has to develop its own trajectory towards fulfilling the goals for clean urban mobility. While many cities have made important steps towards more sustainable transport and show promising developments in different areas, there are also an extensive number of urban areas that are lagging behind, struggling with growing motorisation, ageing transport networks and lack of ambition to transform their transport system. Even if the goal was accepted as a clear objective for all, there would still be huge differences between the cities' achievements and their approaches.

Despite the differences, European cities share urban mobility opportunities and challenges – some which threaten to slow down, undermine or even reverse efforts of transition to a sustainable urban transport future, e.g. economic recession and therefore lack of resources. No matter which solutions individual cities choose to implement, the measures should be within a European framework that does not discriminate between solutions that contribute towards the goal. For example, equal definitions across EU countries provide clarity to the producers of mobility solutions and technology. An example is Low Emission Zones (LEZ) that typically use European Vehicle Emission Stan-

dards to differentiate vehicles. Within such a framework, cities should be free to choose measures that are appropriate, given their different settings.

3.1.2 An enlarged Europe

A particular distinction can be made between the conditions in cities in Central and Eastern Europe, Western, and Southern Europe. In the former cities, public transport systems have typically been highly developed and effective. However, since 1989, car ownership has increased dramatically and typically, the use of public transport has decreased substantially. The quality of the public transport infrastructure and equipment is now in a poor condition in several cities in the Member States within these regions. However, they still experience a high share of public transport users and the public transport is more likely to include electric traction means – such as trolleys and trams. The modal share of cycling is small, as are car-pooling and car-sharing. In contrast, in Western and Southern Europe, the modal share of cycling is comparatively high, the share of cars remains high and stable, while the share of public transport is small (or medium).

Figure 1 illustrates significant differences with regard to modal split, between two old and two newer Member State cities as well as differences within each of the 'groups' of cities.

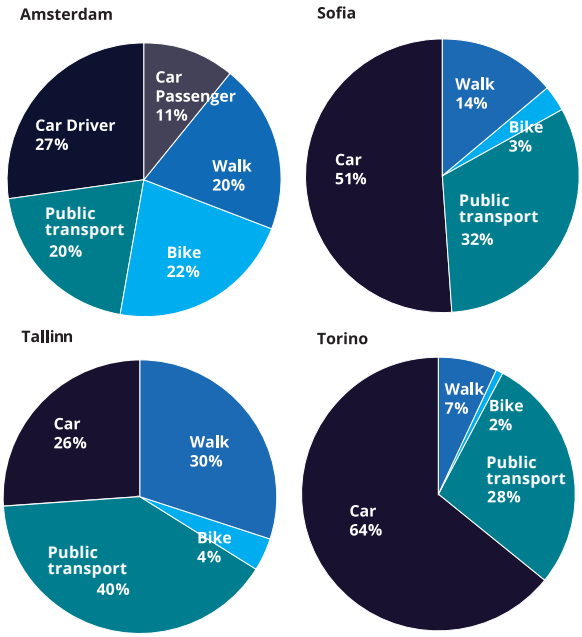

Figure 1: Passenger modal split for selected European cities. Amsterdam 2008, (upper left), Torino, 2011 (upper right), Tallinn 2011 (lower left), and Sofia 2010 (lower right) (EPOMM, Undated)

Differences in the current modal splits provide different opportunities and challenges in becoming more climate-friendly. Cities that are car dominated may for example harvest some 'low hanging fruits' in terms of shifting transport to other modes, while cities with a more balanced modal split may need to focus more on technological substitution in order to achieve improvements.

In terms of freight transport and logistics, cities face diverse realities too. A city's role in supply chains or as a hub for rail or sea networks for example, determines what solutions are appropriate to implement. In some cities significant relief can be obtained by relocating terminals out of city centres to prevent the associated emissions from multiple short freight or 'last mile' journeys from taking place in the densest urban areas, in others, through-traffic which must travel through the city in order to reach another, final destination is a different difficult problem to tackle.

3.1.3 Governance arrangements

Having appropriate political goals and knowledge of relevant measures is not sufficient for a city to attain the goal. There is a need for long-term commitment in order to deliver transition. Governance capacities and effective implementation structures are also important.

One important aspect is alignment at various political levels in order to avoid contradicting policies or policies that undermine each other, e.g. integrated transport and land use planning. Governance structures often include several municipalities in competition with each other for example, for industries and skilled workers.

Innovative governance arrangements include horizontal networks between public authorities and private interests. Collaboration in such networks is often considered crucial in order to contribute to solve 'wicked issues', where public authorities are dependent on the knowledge and contribution of private stakeholders.

Moreover, during the last 25 years, 'new public management' reforms have contributed to reshaping how urban transport is organised and managed – with mixed results. Deregulation and privatisation of former integrated public transport bodies may offer

cost reductions and service innovations but has also in some cases lead to fragmentation of the services, resulting in a less coherent transport system and information. Increased use of tools like performance management may have increased competition and service quality. However, it may also result in lack of consideration of other modes and products than, for example the individual service that the management is responsible for.

What can perhaps be interpreted as new 'modes of governance' includes a diversity of experiments in sustainable urban mobility, initiated by citizens or municipal political-administrative bodies. To an increasing extent cities participate in different networks enabling them to exchange experiences and information internationally on specific topics including transport. Moreover, improved citizen participation is important as it may contribute to 'green' engagement. However, it may sometimes decrease the speed of decision making.

Governance arrangements differ significantly across Europe. Some cities are governed by strong entities encompassing the entire city; some cities are able to raise their own revenue or loans, while others are heavily dependent on central government to support investments through earmarked state funds; management reforms have been carried out in different shapes and extents; so governance capacities and abilities differ as do the amount and level of local experiments.

3.2 Stakeholder groups

Manifold stakeholders at different political levels and in different sectors are important when aiming to achieve a transition to a society with a transport system that lives up to the urban mobility goal. Given various conditions, different solutions are suitable to different cities; and whilst there will be similarities and crossovers, the kinds of measures that are 'suitable' in any given context requires involvement of different sets of stakeholders.

3.2.1 Stakeholders: substitution approach

In an approach characterised by technological substitution the car remains a dominant transport mode in passenger transport, as do heavy vehicles in urban freight. In such an approach, car manufacturers, energy producers such as oil companies and electric utilities, as well as 'new' industries such as producers of biogas or batteries play key roles on the supply side (Marletto, 2014). In this approach local public authorities will be important in facilitating the implementation of new technologies for example, when developing criteria in public procurement processes or supporting what may be considered risky infrastructure projects. Public authorities furthermore are key in overseeing the development of new infrastructure, e.g. EV charging. However, in such an approach the national public authorities, grid owners, and global industrial companies are also important players.

3.2.2 Stakeholders: activity change approach

In contrast to technological substitution, an approach focused on a ***change in passengers' transport behaviour*** – including a shift to public transport, bicycling, walking, and car-sharing – leaves more power in the hands of the local and regional authorities. These authorities, alongside public transport companies and NGOs such as bicycle associations and car clubs, are then the most relevant entities (Marletto, 2014). However, there would still be a need for multilevel action as for example national authorities play an important role in providing legislation and planning frameworks that enable the local and regional authorities to implement climate-friendly measures such as restrictive parking, pricing, and prioritising buses in the traffic.

3.2.3 Stakeholders: city logistics approach

In city logistics, private actors are particularly important for reaching the goal. Urban freight transport is largely operated by and for private businesses, including, but not limited to retailers, service providers, industrial producers, transport carriers and logistics companies, with the fuel supplied by energy companies. Some urban freight operators are huge companies using a diverse range of dedicated delivery vehicles, while others are small companies owning only a few vans or trucks. Transporters take advantage of a variety of vehicles, ranging from large trucks to distribution lorries, vans, scooters, bicycles and carts. The deployment and utilisation of particular vehicles depends on multiple factors and is not always optimised

from an urban perspective. The public sector plays important roles with regard to regulating traffic (reactively or proactively) and the procurement of transport services. For example, the extent to which public authorities coordinate their purchases may reduce the need for transport, as different purchases are transported together from for example a city logistics service centre (CLSC). Public authorities are therefore dependent on a transfer of knowledge between private businesses and themselves. In this sector any policy that affects prices is likely to have large impacts, also on a regional and national scale as it is highly competitive and profitability is small.

3.2.4 New stakeholders

There are opportunities for new stakeholder partnerships. A broader view and framing of the White Paper goal, not just as a transport, planning, climate or any other specific issue, but also in terms of collective challenge is important in order to achieve it. 'Siloes' may need to be broken down and ideas will need to be tried and tested in new ways with more focus on longer-term relationships. Innovation in technical, social and financial terms is key. This further extends the range of potentially relevant stakeholders.

3.2.5 Supporting interests

Which supporting interests are the most important in favour of realising the goal will be dependent on factors such as the national and local mix of industry, the available energy sources and systems, the local culture of mobility, and the types and severity of problems that the local authorities face. The latter is particularly important as cities will tend to find solutions that are acceptable locally, but not necessarily optimal in a context of regional or national distribution. Finally, public and private banks and lending institutions are important actors, as new investments are required to modernise public transport and revitalise urban infrastructure.

3.3 Key trends

Urban mobility is highly complex. Demand for and supply of urban passenger and freight transport are driven, influenced and balanced by a wide range of interacting factors such as economic activity, organisation and prices, technology changes, socio-demographic and cultural factors, as well as institutions and policies.

Table 1 (page 20) summarises a number of drivers and trends that the TRANSFORuM process has identified as likely to influence European urban mobility and the realisation of the goal in an enabling (positive) or a constraining (negative) way. It illustrates that markets (e.g. energy prices) and demand (e.g. mobility needs) are important in terms of whether a trend has positive or negative climate effects (for more information, see TRANSFORuM's Deliverable 3.1 "Summary on main policies, funding mechanisms, actors and trends")[5]. In order to achieve the goal, solutions could seek to exploit the positive contributions, while anticipating and evading the negative ones.

For the purpose of illustrating implications of trends, we highlight three examples: alternative fuel investment, young people and urban deliveries.

3.3.1 Investments in alternative fuel systems

The majority of all new registered cars in Europe have petroleum (42%) or diesel motors (55%). Other technologies (i.e. hybrids, electric, and natural gas and ethanol-fueled vehicles) make up only 3% of the market share (International Council on Clean Transportation, 2013). Currently several alternative fuel systems exist, including methanol, ethanol, butanol, rapeseed methyl ester (RME), methane, propane, synthetic diesel from biomass, electric energy stored in batteries or hydrogen. However, it is difficult to predict which one of these will be a future 'winner' or 'loser'. The reason is that the use of alternative fuels and investments in infrastructure and new drivetrains make changes expensive in the short run. Usually, there is a need for governmental support (e.g. investments and incentives), as new fuels and new infrastructure are risky investments.

5 Deliverable 3.1 is available at: www.transforum-project.eu/resources/library.html

Drivers and trends	Examples of positive contributions to goal	Examples of negative contributions to goal
Urbanisation	Better potential for public transport and active transport	Increased demand for transport; sprawl
Energy prices	Increasing oil prices make alternatives competitive	Continued fluctuations make investments uncertain
Ageing population	On average less car use; better supply of public transport	Increasing car use among older people (e.g. because more women have a driving licence)
Young people's lifestyles	May avoid cars because of ICT and alternative mobility solutions	Cars remain a status symbol; young may just learn to drive later
More efficient engines	Reduced emissions	Rebound effects: efficiency provides for cheaper and therefore more driving
Investments in alternative fuel systems	Economies of scale for alternatively-fuelled vehicles	Batteries, EVs remain expensive
Growth in urban deliveries	Consolidation and promotion of EVs and e-bikes	Access restrictions on inner city logistics lead to longer trips (e.g. around the city centres)
Urban transport planning	Citizens become engaged in sustainable mobility plans	Planning remains poorly coordinated
Public transport development	Modernisation and priority to public transport services	Insufficient funding/priority leads to decline in public transport
Information and communications technology (ICT) deployment	Quality of service improves; attractiveness of alternative modes increases, e.g. WIFI on public transport	ICT can be used to stimulate mobility and throughput of vehicles
E-commerce	Decreasing passenger transport	Increasing freight transport

Table 1: Examples of key trends and their potential impact on the urban mobility goal

Biofuels are often more climate-friendly than fossil fuels. From a lifecycle perspective biofuels are more or less CO_2-neutral, which is their competitive advantage. Biofuels were considered promising until crucial drawbacks were pointed out (Cf. Mitchel, 2008). Concerns such as reduced bio-diversity, competition with food production and poverty concerns contributed to a decrease in the interest and investments in biofuels. The focus today is rather on second and third generation biofuels, which do not compete with food production.

Advantages of new Euro VI engines and diesel fuels for Heavy Duty Vehicles are the low amounts of local air pollutants emitted (NOx, PM and other toxic compounds). Euro VI diesel engines are more than 90% cleaner than the former Euro V engines (Hagman and Amundsen, 2013). Such technology can therefore compete with biofuels in terms of clean tailpipe emissions. However, biofuels are favourable in the sense that their climate impact is low, as they are more sustainable and can come from renewable sources.

Fuel cells for the conversion of produced and stored hydrogen to electric energy on-board vehicles has repeatedly been appointed as the 'great' fuel solution. In 2014, several vehicle manufacturers have announced that they will start test production of pre-commercial fuel cell vehicles, arguing that fuel cell vehicles (FCV) will be economically competitive in the 2020s.

There is currently a small test market and this will grow for most of the alternative fuels like biofuels in ICEs and hydrogen in FCVs. For which fuels there will be a demand and how fast the market will grow, is dependent on governmental support and fuel system investments. Timing, public pressure, climate concerns and choice of fuel strategies are important for success.

In 2014, electric energy from carbon neutral electric power production is considered the leading path for sustainable automotive propulsion (e.g. EVs are typically mentioned specifically in EU documents while other alternative fuel systems are often referred to as 'other' fuels). Advances in battery technology and production and the fact that the energy efficiency of electric drive is superior, contribute to the explanation of why electrification is very much the 'name of the game' in 2014. Electrification includes increased energy efficiency with pure EV, Hybrid Electric Vehicles (HEV), or Plug-in Hybrid Vehicles (PHEV). Heavy Duty Vehicles may use future electric roads and pantographs to charge their batteries part of the travelling distance.

Figure 2 illustrates the market share and number of EVs sold across Europe. The market share is particularly high in Norway and rising in countries like the Netherlands and the UK. Several cars that have been sold in France have been exported to the Norwegian market, due to an economic incentive in France, which has since been removed. However, it gives France an artificially high figure in the illustration.

Electrification of vehicles is a two-fold trend. On the one hand, electrification has gained foothold in the market in some countries (e.g. Norway and the Netherlands) and some established car manufacturers (e.g. Nissan and Tesla) have increased their sales to an extent that this technology is starting to become self-sufficient (Figenbaum and Kolbenstvedt, 2013). There is also a new wave of PHEVs entering the market. The fact that there are several manufacturers competing in the plug-in market contributes to decreasing the price. On the other hand, the price of EVs and PHEVs remain high in most countries. The market for such technology is stagnant and low, with few exceptions (Figenbaum, Kolbenstvedt and Elvebakk, 2014). There is still a need for incentives to make a transformation within this field. Currently countries (Germany, for example) are reforming national legislation in order to allow local authorities to implement for example free parking and use of public transport lanes for EVs.

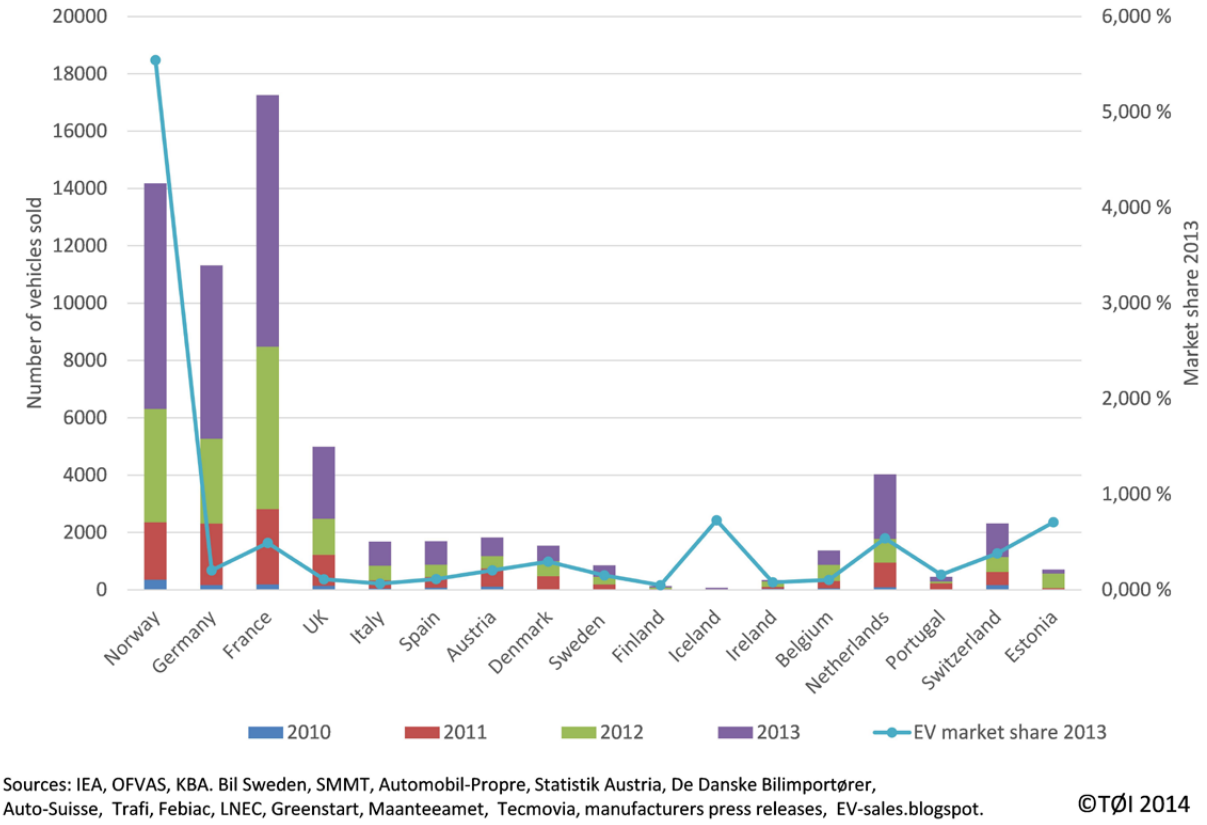

Figure 2: Market share and EVs sold across Europe (Figenbaum, Kolbenstvedt and Elvebakk, 2014)

3.3.2 Young people

An interesting trend is the fact that young people in urban areas tend to travel less by private car than the same age group did a decade earlier (Kuhnimhof et al., 2012). They show a more pragmatic attitude towards car ownership and transport than earlier generations (Schippl, 2013) and delay taking a driver's licence until they get older (Hjorthol, 2012). Suggested reasons include unemployment, prices, more time spent in education, urbanisation and changes in travel attitudes. In addition, new technologies contribute to this trend as technology may substitute travel needs (e.g. creating possibilities to work from home) or provide better public transport information (Line et al., 2010). Decreasing car ownership may also contribute to a rise in car-sharing. Congested roads and lack of parking also contribute to this trend; as such restrictions make alternative ways of travel more competitive. However, in most countries owning a car remains a status symbol and the younger generation may still buy a car, just when they get older.

3.3.3 Growth in urban deliveries

Urban logistics and freight transport comprise between 20–30% of urban traffic and is dominated by heavy vehicles. While local public authorities tend to focus on passenger transport, freight is gaining increasing attention due to the environmental and climate impacts (e.g. noise, congestion, lack of available parking and road space, accidents, air pollution and CO_2 emissions) that create a need for regulations and restrictions (Gonzalez-Feliu et al., 2013). Such concerns and the growth in small urban deliveries due to among other increasing internet-based shopping call for innovative solutions.

There is an increase in initiatives that contribute to limiting urban freight traffic and reducing CO_2 emissions. For example, with support from public authorities, the number of CLSCs has increased in Europe. Studying European cities, Morana et al. (2014) have counted 75 such initiatives; however, only 30 of them were operational in 2010.

In general, it is challenging to make on-going small-scale projects large enough to become economically feasible. Demonstration projects such as the EU-funded project STRAIGHTSOL[6], show that while contributing to decreasing CO_2 emissions, such activities are much more expensive than 'conventional' urban freight transport. CLSCs have disappeared or never made it beyond the experimental stage, as subsidies have been withdrawn (*Ibid*). Similarly, it remains to be seen whether the use of cargo bikes within urban logistics is a gimmick.

So far, introducing larger policies such as environmental zones that restrict access for freight transport in city areas has proven more effective. However, a disadvantage is that the travel distance may increase as the operators are directed to other roads around the city. Collaboration between private and public interests may contribute to a common understanding to continue city logistics initiatives.

3.4 Barriers for change

The trends may enhance possibilities and create barriers. However, there are many other barriers to achieving the White Paper goal. In the following section, we highlight key barriers for the three different areas: technology substitution, passenger transport behaviour and city logistics.

3.4.1 Technology substitution

A key barrier within technological substitution is the risk of new innovative solutions having unexpected effects and losing in competition with other solutions. Technology creates barriers, as the incremental pace of change in the market does not enable the rapid development of technologies that the goal calls for. EVs in the Norwegian market for example, did not get a foothold until safer and higher quality models had been developed, although several favourable policies were already in place (Figenbaum and Kolbenstvedt, 2013). Moreover, technological neutrality is often seen as important in order to let technology leaders develop, yet new technology may also require investments in order to become established in the first place. Some technology choices may therefore be required to speed up the market. However, different countries and cities may choose to support different technologies, thereby ensuring competition between different

6 www.straightsol.eu/overview.htm

technologies. Economically, the existing systems embody enormous values that cannot easily be discarded without significant losses and sunk costs, and the economic turnover in regard to vehicle fleets and (not least) infrastructure is generally slow. Costs for alternative systems such as electromobility or hydrogen propulsion are currently high. However, niches such as car-sharing may be a good starting point for overcoming such cost barriers. Socially, while being a forerunner in using new technological solutions may provide social acknowledgement, there are several social and competence barriers that may create obstacles. The public may be concerned that they will not be able to sell the vehicle that they have purchased due to lack of a second-hand market or they may be concerned with the driving range.

3.4.2 Passenger transport behaviour

An important barrier in facilitating changes in passenger transport behaviour is political. Several measures that impose a change in behaviour or induce costs on citizens or business are sometimes unpopular. The example of congestion charging in Stockholm suggests that such resistance may decrease, if the affected population also experiences the benefits of such measures through an experiment (Eliasson et al., 2009). In general, policy packages may contribute to overcome such barriers. The ability to show that a city is not the only one introducing punitive measures may also contribute to their legitimacy, and the idea of sharing successful experience with and learning from other cities is therefore important. Setting up well-timed and short-, medium-, and long-term goals in advance as well as providing sufficient time for adoption (such as in the case of the congestion charging scheme in London) is also of vital importance. Economically, the costs for modern, competitive public transport systems are high. Technologically, some user groups (e.g. older people) may struggle to adapt to new ICT solutions, if obtaining travel information is dependent on such technology. Coordination is also an issue for achieving modal shift – it is a key challenge in transport planning at the local level. Transport planners, researchers and interests that have participated in the public consultation process of the urban mobility package highlight lack of coordination as a particular challenge (ECORYS, CENIT and COWI, 2013). To deliver substantial changes in urban mobility, comprehensive actions that include land use planning, road use, parking, transport pricing, infrastructure development and public transport policy are needed. However, such competence tends to be fragmented. In cases of land use planning or location decisions, inefficiencies occur when public authorities and companies do not take sufficient consideration of the impact that their choices have on the transport system as a whole.

3.4.3 City logistics

In city logistics, a key barrier is that even though a measure may seem profitable, costs and profits are unevenly distributed among different interests, i.e. certain interests 'win' and others make losses from the implementation of a measure (Andersen and Eidhammer, 2014). For example, operators have an interest in maximising the use of their vehicles (MDS Transmodal, 2012), but not necessarily in less transport. Furthermore, it is difficult to make businesses change their behaviour and operations. Even if a business considers a new climate-friendly solution as promising, it needs to reach a certain scale in order to reach a rate of return. This is a barrier that has stopped several good initiatives (Andersen and Eidhammer, 2014). A key barrier is also the lack of understanding among policymakers about how the logistics industry works. Consultative planning and cooperative forums are crucial in order to ensure adherence to public objectives, while drawing on useful information from private operators when designing useful policy measures (Andersen and Eidhammer, 2014; MDS Transmodal, 2012).

The following chapters will take this diversity of context across Europe into consideration and are mindful of stakeholders, trends and barriers that may impact progress towards the urban goal. It will develop a series of 'building blocks' that would help Europe's cities to navigate through these challenges towards 2030.

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4 Building blocks for change

4.1 Overall perspective

According to TRANSFORuM stakeholders, reaching the goal is likely to require substantial transformations of technologies, services and behaviour within the entire area of urban mobility and transport. It will imply fundamental changes to the development, adoption, and use of vehicles and propulsion systems, and to the provision of logistics services in cities all over Europe. However, it is also evident that many already existing examples demonstrate that such transformations are not impossible.

Good practice examples

Throughout the following sections, examples from TRANSFORuM's previous work on good practice in the context of the White Paper (Deliverables 5.1. and 5.2)[7] will demonstrate identified factors of success. These examples will be presented in small blue boxes.

Markets and technologies are constantly evolving and the goal is not likely to be accomplished unless multiple actors at different levels from city to national to EU level, and across the public and private sectors and civil society undertake a broad variety of actions to change the current conditions, systems and developments. As the White Paper states: ***"Inaction is not an option".***

There is not one, nor a single set of actions or measures that are likely to be sufficient. A broad range of actions need to be taken over the next decades. The TRANSFORuM debates mostly converged around the following broad strategic areas:

- Technological substitution of conventionally-fuelled passenger cars;
- Reduced use of private passenger cars for transport in cities;
- Increased utilisation of low carbon city logistics technologies and practices.

7 Deliverables 5.1 and 5.2 are available at www.transforum-project.eu/resources/library.html

Within and across these strategic areas, changes in supply and demand need to supplement and reinforce each other, to transform the production and consumption of urban mobility. It is not viable, for example, to increase the supply of alternatively-fuelled vehicles, if consumers are not able or willing to demand them; and it is not sufficient to nurture a demand for CO_2-free logistics services for certain niche products, if dependence on fossil fuels is expanding much more strongly in other areas of delivery.

How to develop and match supply and demand in order to foster change towards sustainable transport systems, while ensuring viability for social and economic development in cities is an important question for local, national and European governments and stakeholders.

The strategic areas mentioned above form the basis for developing this roadmap for the urban mobility goal. Each of these elements suggests different strategic areas and building blocks need to be developed and activated as part of the implementation of the roadmap. Here we outline both what these building blocks look like and discuss some of the actions that could be introduced or expanded within each area to move towards achieving the goal.

4.2 Strategic building blocks explored

One can distinguish between two main domains of what is being transported, namely passengers and goods, and the two basic approaches of what needs to be changed, namely transport technology, and transport activity. Figure 3 outlines the three abovementioned strategic areas in several blue coloured boxes respectively. It furthermore shows a series of building blocks required to change transport technology and activity.

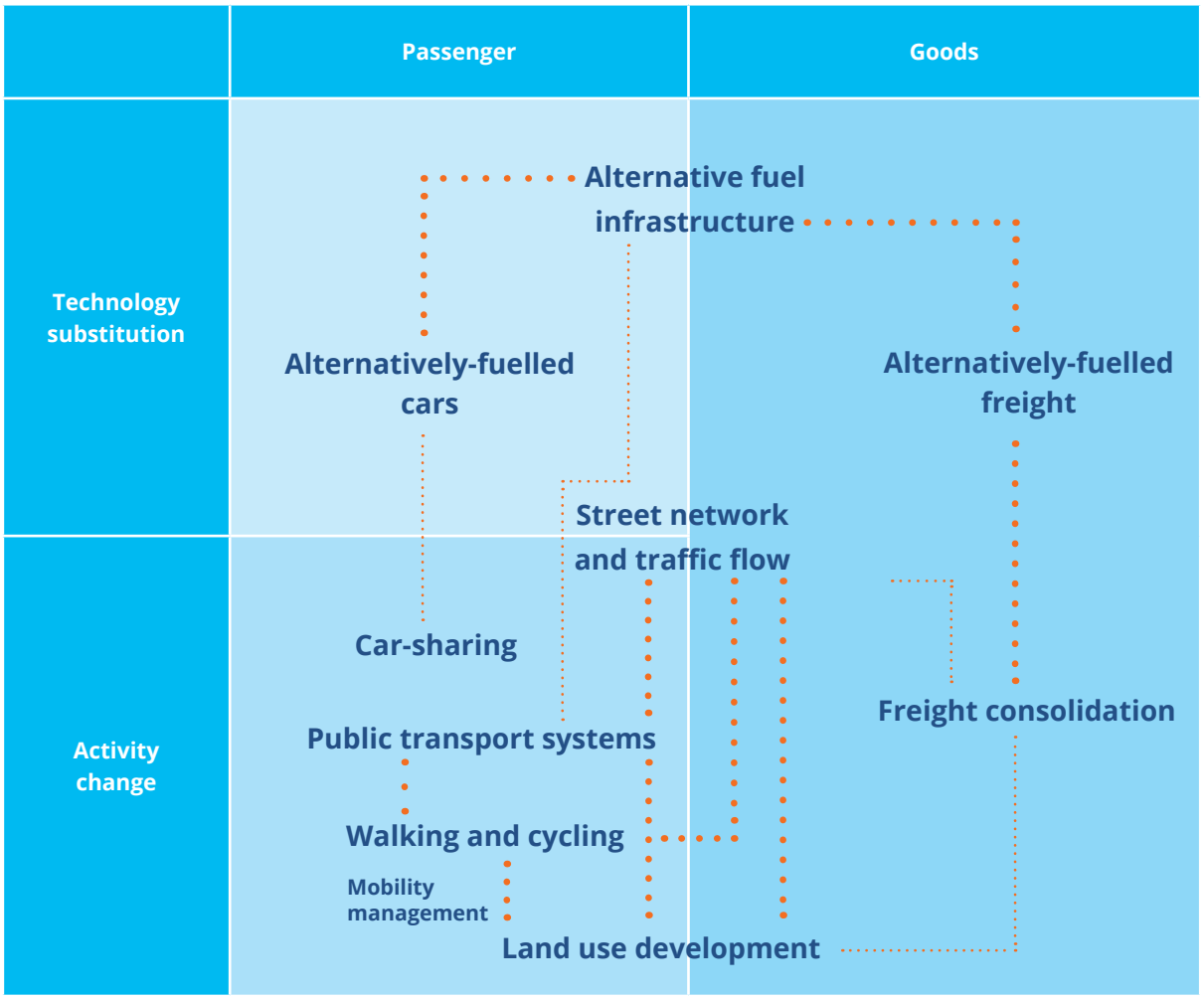

Figure 3: Strategic areas and building blocks for urban mobility. Red lines indicate blocks that may interact

A differentiation between ***passenger*** and ***goods*** is relevant because of the different character of the transport functions and services, the different types of vehicles required for each, and the different stakeholders involved. Goods transport, for example, has the issue of empty running due to the one-way character of the supply chain that does not apply equally to passenger transport. There are however also overlapping and common elements too, such as the need for similar infrastructures and fuel supplies and the (as of yet) manual control of vehicles in traffic. Passenger cars are also sometimes used to transport goods (e.g. groceries), and goods vehicles to move passengers (e.g. co-workers). The building blocks therefore allow the two domains to be bridged.

A differentiation between ***technology substitution*** and ***activity change*** is relevant because of the different types of policy measures and scales of intervention required to influence them. Technologies need to some extent to be standardised over a wide scale to become efficient, while activity change in transport to a higher degree needs to consider local or regional contexts of demand and supply, in order not to affect mobility and access negatively. The distinction reflects the duality in the goal between vehicles and their use. In this area there are nevertheless overlaps and correspondences, where, for example, changes in costs, prices and taxation may influence both the demand for alternatively-fuelled vehicles and the ways the cars are used. Technology substitution and activity change within goods transport here will be treated as one strategic area, because it makes less sense to separate those.

To achieve the urban mobility goal, there is a need for policies and measures that either 'push' or 'pull' building blocks within all three strategic areas. This will involve different combinations of measures in individual cities and Member States, and it is not to be assumed that the building blocks need to be pushed or pulled in the same way everywhere; only that they represent the most essential building blocks for a general roadmap towards the goal.

The literature sometimes refers to three strategic approaches to obtain low carbon transport, namely to, 'avoid' transport, meaning the elimination of the need for movement altogether; to 'shift' car or air transport to lower emitting modes such as walking, cycling, rail, or bus transport, and to 'improve' the efficiency of the transport systems, either in terms of capacity utilisation, energy efficiency, or carbon content of the fuels. These three strategies can be applied by addressing all three areas.

It is clear that the strategic areas are related, overlapping and could be mutually supporting. For example increased car-sharing might support the introduction of alternatively-fuelled vehicles. This is tentatively illustrated with red lines in Figure 3.

It should also be emphasised that neither the strategic areas nor the building blocks constitute 'strategies' on their own, but when accompanied by initiatives, frameworks, processes, measures and funding, they constitute the basic areas for intervention in a roadmap for the urban mobility goal. In the following section, we introduce strategic building blocks within each of the three areas, and discuss some of the ways in which they can be pushed and/or pulled.

4.3 Technological substitution of conventional passenger cars and fuels

4.3.1 Alternatively-fuelled cars

As mentioned in Chapter 3, there are several alternatives to conventional petrol and diesel (fossil fuel) cars.

One alternative is 'mild hybrids', which are basically fossil fuel cars with an electric 'helping device' to save fuel while braking or stopping. As discussed in section 2, excluding 'mild hybrids' from counting as 'non-conventional' vehicles could be considered, because of their limited contribution to reducing oil dependence, emissions and other urban transport problems.

Various kinds of biofuel represent another non-conventional propulsion source; however, there are uncertainties with regard to the sustainability of this alternative (Bailey, 2013), and the actual fuel purchased by car owners. Currently EVs are considered a key technology to replace conventionally-fuelled cars (see section 3), although it is still uncertain whether they will become a fully viable and competitive alternative.

Good practice: Norway, Germany, Madrid

Norway's comprehensive EV policy framework has been very successful in transforming the fleet. Since the early 1990s, the government has gradually introduced a package of incentives including reductions in high car taxes, bus lane access and exemptions from toll road charges.

Germany's 'Electromobility Model Regions' is a competition-based initiative in which the government is promoting widespread introduction of EVs and infrastructure by 2020. The €1,5 billion programme aims to get one million EVs on the road by 2020. It is seen as promising due to its cross-cutting character and large scale. Many countries and some cities offer more or less comprehensive incentives. Some projects within the programme provide support to build up the whole ecosystem around electromobility.

Efforts in **Madrid** to integrate EVs have also given the city the largest fleet in the country.

The main issues obstructing wider adoption of EVs are range, costs and charging times for batteries (see also chapter 3). Even if range is not so critical for short urban trips, consumers may perceive it as an obstacle. Continued research and development (R&D) is expected to significantly improve battery performance and lower costs over time, and models are available where the range issue is overcome (ranges 300–400km) although at a high cost. One of these models was the most sold car among all available car models in Norway in March 2014.

An interesting possibility is to introduce EVs through *car-sharing* and *rental services*. In a city like Paris, for example the 'Autolib" sharing system constitutes a major part of the city's EV fleet. This may serve to familiarise a much larger share of travellers with non-conventionally-fuelled driving rather than via conventional ownership. Electric drive is often suitable for typical urban car trips, and is beneficial for the environment compared to conventionally-fuelled cars. However the benefit may be smaller if the shared EV cars replace trips made by bicycle and public transport.

Public transport is already widely based on electricity in many cities, notably by metros, trams, suburban rail, and trolley buses, the latter typically in Central and Eastern European cities, like Gdynia, Poland (see below). An estimate is that 40–50% of public transport in Europe is based on electricity today. Many cities are introducing or extending their rail-based systems, sometimes closing parallel bus lines. In smaller cities and more dispersed areas, the majority of public transport is provided by diesel buses, although examples also exist of entire bus fleets based on gas (e.g. Toulouse, France), and (more experimentally) buses using electric or hydrogen propulsion. In London diesel-hybrid buses have been in use since 2006. The electrification of public transport is not directly included in the urban mobility goal, but it can help achieve some of the associated goals, such as to limit CO_2 emissions, and to reduce the attractiveness of cars.

Good practice: Gdynia, Toulouse

Gdynia committed to retrofitting its trolleybuses from diesel to electric power and encouraged passengers back onto the network.

Toulouse has been successful in switching 100% of its diesel bus fleet to run on CNG.

4.3.2 Alternative fuel infrastructure

Electric forms of transport need electricity supply through wires or charging options and systems. EVs need Electric Vehicle Supply Equipment (EVSE). FCVs need hydrogen supply, and biofuel-based cars need a distribution systems for ethanol, biodiesel or similar. The impact on CO_2 emissions for electric forms of transport depends much on the power sources used to supply the electric grid. In the best cases the emission reduction potential is near 100%; in the worst cases it is 20% or even less.

Some alternatives like hydrogen require investments in fundamentally new infrastructure; others require extension and modernisation to become fully viable, such as high-speed chargers, and the deployment of 'smart grids', allowing EVs to interact with the power supply system in an intelligent way. Apart from slow or semi-fast AC charging at the home or distribution company there is a need for additional fast DC charging and/or battery swapping options if EVs are to serve as full alternatives to conventionally-fuelled cars. It is important that systems are standardised to ensure interoperability and avoid duplication of systems and costs.

The European Community institutions have recently agreed on standardised plugs for EVs and re-fuelling equipment for other alternative fuels. Agreement has also been reached on a strategy to roll out alternative fuel infrastructure such as charging points. It will now be up to Member States to develop and deploy such plans.

Good practice: France

In April 2014, the **French** government announced the adoption of a regional framework for EV charging. This will enrol the Autolib' scheme for **Paris** with over 5,000 existing charging terminals, that will become partly (250 in a total of 5,000) open to third parties.

Some private operators like oil companies and car retail or charging services are rolling out EV charging systems on a commercial basis. It is not yet clear exactly what types of systems, provided by whom, would be needed to fulfil the urban mobility goal in an optimal way. Also consumer charging behaviour is not known: whether they will charge vehicles overnight or during the day, with different impact on CO_2-emissions.

Countries, regions and cities employ a range of measures to promote the supply of and demand for EVs, including, support for R&D; financial incentives to purchase EVs; provision of fuelling and charging systems away from home, transport advantages (e.g. free parking for EVs, driving in bus lanes etc.) and other measures. It is generally acknowledged that the success in Oslo and Norway is due to the particularly broad and generous measures, where exemption from high car taxes and privileged roadway uses directly make EVs economically more attractive than comparable conventionally-fuelled cars. The costs of the programme in terms of forgone taxes etc. are substantial, but not known in detail (Figenbaum, 2013).

4.4 Reduced use of private passenger cars for transport in cities

4.4.1 Land use development

Land use and urban form have long lasting impacts on factors such as location choices, commuting patterns, travel distances and mode choice. Changes in land use patterns can, together with urban (re)development and new infrastructure, help reduce the need for travel and the use of cars. A global estimate by the Intergovernmental Panel on Climate Change suggests that over the medium- to long-term (2030 and 2050, respectively), such measures could potentially help reduce greenhouse gas (GHG) intensity of transport by 20–50% below a 2010 baseline, through more compact and integrated public transport, improved cycling infrastructure, and walking-oriented urban planning.

However, the figure is likely to be lower in Europe, where such an approach is already widespread. Many cities and countries directly apply land use policy measures as part of planning frameworks and policies to limit CO_2 emissions, a prominent example being 'compact city' strategies.

The interactions between transport and land use are highly complex and despite decades of research there are many unanswered questions, on how much transport demand and associated effects can actually be influenced by intervention in different spatial parameters such as density, diversity or design, and by using planning instruments such as zoning, investments, restrictions on development, densification, and other measures. The results of planning efforts are likely to be unique for each city.

Nevertheless, it is important to include land use policies and measures to at least avoid the negation of reduction in emissions from cars through urban sprawl. Integrated land use and transport development to maximise benefits of public transport investments should be seen as an essential element in sustainable urban transport planning.

Good practice: Freiburg, Maribor

Freiburg in Germany has been successful in multimodal urban planning, including both incentives and disincentives to limit car traffic. Only 32% of journeys were made in the car in 2007, down from 38% in 1982. Public transport use has risen from 11 to 18% over the same time period.

Maribor in Slovenia developed a Sustainable Urban Mobility Plan (SUMP) in 2013, laying the foundation for a strategic action plan for the period until 2018. The city council aims to have a split modal share of 25% cars, 25% public transport, 25% walking and 25% cycling by 2020.

4.4.2 Public transport systems

Shifting passengers to, and investing in new and improved public transport is one of the most obvious ways to help reduce the use of cars in cities, conventionally-fuelled or otherwise. Surveys of citizens and professionals often show that improving public transport is seen as the most important of all measures for sustainable urban transport (Rodier et al., 2010). Public transport can provide comparable service comfort and cost to using a car for many urban trips, not least commuting. However for less densely-populated or sprawled areas, public transport is not always a viable alternative.

Promoting and investing in modernised, integrated, clean public transport systems can provide cities and societies with a range of other benefits, in terms of mobility, accessibility, economic performance, safety, quality of life and environmental improvements; or may at least help reduce growing use and dependence on cars, even if the contribution to achieve the specific urban mobility goal in some cities could be limited.

Many European cities invest in modern public transport systems, such a light rail, driverless metros, cost saving Bus Rapid Transit (BRT), as well as electronic, integrated ticketing, passenger information and payment systems that can make public transport more attractive for the passengers.[8]

In many cases it is a significant challenge to secure investment to set up such new systems, as well as their subsequent maintenance and operation. Financing public transport is seen by some as the most crucial factor for succeeding to increase the attractiveness and use of the mode (Austin et al., 2012). There are growing efforts to attract private capital to invest in public transport systems and services, for example through public-private partnership (PPP). There are examples of significant successes, where PPPs have managed to deliver public transport infrastructure at lower cost and/or shorter time than through public funding alone. However not all public transport projects are attractive from a private investor point of view, and not all examples have led to a reduction in the use of cars (Pettersson, 2014).

4.4.3 Walking and cycling

Cities are essentially made for walking, and in many urban areas it remains the most widely-used mode, despite often being neglected in planning. Without excellent facilities for pedestrians, it is less likely efforts to encourage drivers out of their cars will be successful.

Cycling represents a real alternative to driving for many shorter urban trips. In some cities like Copenhagen and Amsterdam, cycling has obtained truly significant shares of passenger transport, as a result of historical conditions, cultural factors, and many years of planning and investments to improve conditions and safety. In most cities the share is below 5%, while Copenhagen has 25% mode share and Amsterdam 33%. The gap between these extremes highlights a significant potential contribution to achieving the White Paper goal, if car users could be motivated to shift to cycling for parts or all of their travel.

A recent study by the World Health Organisation (WHO) concludes that investing in cycling solutions could entail significant economic benefits in regard to improved health as well as jobs created. It is estimated that, if measures were taken to achieve the same modal share of cycling as in Copenhagen, in a city like Dublin, 29 lives could be saved and 550 new jobs could be created. For Bucharest, 130 lives saved and 2200 new jobs. To obtain such results would likely require significant measures to improve safety and facilities for cyclists (WHO, 2014).

The potential could be even larger, as Copenhagen does not even consider to have plateaued yet but aims high-

8 The TRANSFORuM roadmap on European Multimodal Transport Information, Management and Payment provides more detail about this specific White Paper goal

er. A particular challenge is to attract longer distance commuters, who have the most extensive use of cars. A possibility is to improve interchanges and integration between public transport and cycling to help overcome such issues.

Good practice: Copenhagen

One of the first large urban bike-sharing schemes was launched in **Copenhagen** in 1995. Similar schemes now have been set up in many European cities, e.g. Barcelona, Bucharest, Ljubljana, London, Paris, Prague, Tirana, Warsaw (WHO, 2014).

4.4.4 Car-sharing

An important option and lifestyle trend is sharing, especially car-sharing, either informally or through commercial car clubs. Car-sharing is continuously growing in several European countries.

Many see car-sharing as a way towards more sustainable mobility, since a shared car can eliminate the need for several individual cars, depending on circumstances. Some also see it as one of the best ways to introduce alternatively-fuelled vehicles to a wider audience. Some car-sharing clubs and companies include EVs or are – like Autolib' in Paris – fully focused on e-mobility. Car-sharing increases the intensity of vehicle use, making investment in these types of vehicles more attractive. It is likely that car-sharing in some form will increase in the future, considering current growth trends.

Good practice: Bremen

A municipally-led 'Car-Sharing Action Plan' for **Bremen** sets the target of 20,000 car-sharers by 2020 replacing at least 6,000 private cars (Glotz-Richter, 2014).

4.4.5 Mobility management

Mobility Management can be described as actions that affect the demand for transport in connection with the development and operation of major urban activity centres (like shopping malls, cultural venues, sport stadiums, hospitals, and major workplaces). This can involve for example schemes for parking provisions, car sharing, support to the use of non-motorized transport modes, or public transport services or access to the facility, and other physical or behavioural measures. Mobility Management initiatives can be undertaken by individual (public or private) property owners, or jointly by groups of employers or activity venues located in the same area. Mobility Management measures are best incorporated already at the phase of location, design, and development of major urban activity centers, but can also be adopted for existing facilities and locations. Many cities support, and some directly prescribe the use of Mobility Management measures as a condition for certain urban development schemes.

4.5 Increased utilisation of low carbon city logistics technologies and practices

A number of urban freight measures can contribute to reduce CO_2 emissions in city logistics. Among these are clean vehicles, CLSCs, on-, and off-street delivery areas, out-of-hours deliveries, other regulations on traffic and parking, urban freight intelligent transport systems (ITS) management systems, freight partnerships, etc. Here two of the most important are covered: Alternatively-fuelled goods vehicles and goods consolidation.

4.5.1 Alternatively-fuelled goods vehicles

Nearly all trucks and vans used in cities run on conventional diesel. There is currently no fuel or CO_2 efficiency limits or target for trucks in Europe. A growing range of EVs are nevertheless becoming available on the market and they are being deployed for various distribution and delivery functions. A recent report from the ENCLOSE project (AustriaTech, 2014) lists more than 40 different models of different sizes and types.

Electric freight vehicles (EFV) provide benefits in terms of opportunity for significantly reduced emissions and noise, as well as some advantages such as driver satisfaction. There is also an image factor for the companies to consider. Like for passenger transport, the CO_2 effect depends on the fuel mix of the grid. EFVs are currently most suitable for so-called 'last mile' deliveries involving short-distance distribution. Costs associ-

ated with vehicle purchase, fuel price, battery durability, operational constraints etc. are important for the economic viability of using EFVs for goods distribution, and the scope for their use is so far limited.

Urban deliveries could be seen as a relevant market for EFVs, since they involve large fleets, and stop-and-go activities. The uptake could be supported through increased delivery windows for EFVs, for instance.

Often electric vans and trucks are included as part of subsidised experiments and research, although they are also increasingly a part of commercial operations. Many mail companies are for example introducing EFVs as part of company efforts to reduce CO_2 emissions.

Good practice: Norway Post

Norway Post operates a diverse range of vehicles including over 600 EVs differentiated according to distribution areas and tasks[9]. Deutsche Post DHL has extended its fleet of alternative vehicles by over 4,000 cars throughout the past year, increasing the number to 10,500 today.

9 Gunnar Inderberg, Presentation at TRANSFORuM Urban Mobilty Workshop– Oslo, 24 Oct 2013

There are dozens of examples of EFVs being used for last mile distribution to inner city retailers, restaurants etc. This is usually in connection with the operation of a CLSC. Such systems were initiated in Dutch cities like Nijmegen, and distribution systems using one or more EVs exist in cities in Belgium, France, Germany, Italy, Spain, Sweden and the UK, although the fleets are generally small.

Bicycles are emerging as an alternative distribution mode for certain types of urban deliveries. Cargo bikes have the potential to become a viable 'last mile' vehicle, particularly in high density and congested areas. E-bikes and tricycles have been introduced successfully in cities in Denmark, France and the UK and elsewhere. There is an obvious opportunity to promote cargo bikes for central urban areas, where car traffic and truck deliveries are restricted (UN Habitat, 2013).

Good practice: CycleLogistics

CycleLogistics was a three-year European project, which used 'living laboratories' in various cities to extend the use of cargo bikes for lightweight delivery and run consumer tests to investigate new applications for cycling. The project also established the European CycleLogistics Federation.

Municipalities themselves can often use some alternative EFVs in their own fleets, or via contractors, for example for street cleaning, garbage collection and other functions. Waste gas is also sometimes used. In some cities the authorities use this to make up the majority of alternative goods and service vehicles.

The EU has adopted Directives and guidelines to support the promotion of clean and energy efficient road transport vehicles, e.g. for green public procurement. Some cities like Oslo have recently adopted procurement rules that will require the use of EVs for transport services to the municipality.

All in all, electric and other alternatively-fuelled distribution vehicles could contribute significantly to provide "*essentially CO_2-free city logistics*" for at least some parts of urban distribution and delivery. However for other parts of incoming and outgoing transport (long-distance without local sourcing or consolidation) it is so far a less viable option. There are also obstacles and challenges in terms of the reliability of EVs and the associated infrastructure, and the availability of spare parts and repair facilities. Some of these obstacles may be temporary however, due to a still very limited market.

4.5.2 Goods consolidation

Increased consolidation of goods in city traffic is important to reach the goal. Consolidation makes it possible to carry out urban deliveries with small vans and in larger cities to fully load vehicles. Consolidation thereby contributes to reducing excessive driving and emissions, which is a problem especially in large congested cities and urban areas (Allen and Browne, 2010). There are several ways to consolidate goods in order to improve capacity utilisation and eventually

save road space and emissions. The optimal methods depend much on the size of the flows and on the type of commodities and supply chains involved. Planning, management and optimisation of good flows, is primarily a matter for the industry (shippers, receivers, carrier), operating under market conditions, and some supply chains already practice highly efficient consolidation on a chain or sectorial basis.

CLSCs (also known as Urban Consolidation Centres (UCC)) are strategically located facilities used to enable the concentration of multiple deliveries of goods and parcels into more consolidated flows, and thereby limit the traffic and environment pressure in cities. At CLSCs, streams of goods from multiple sources and consignors are unloaded, consolidated and distributed to urban destinations (retailers, construction sites, offices etc.). The consolidation allows reducing the number of vehicles entering the streets and the number of deliveries each destination must handle. Often less polluting and less intrusive vehicle types can be used for the distribution rounds, for example EVs or cargo bikes. CLSCs have been set up in an increasing number of cities in Europe mostly with support from public authorities.

Good practice: Växjö

The Swedish municipality **Växjö** has set itself the goal of being fossil fuel free by 2030. The city was part of the European project **TRAILBLAZER** that aimed to reduce freight emissions, noise and delivery costs, while improving security, reliability and time savings. As part of this project Växjö has coordinated the distribution of goods to the various municipal units. Among other outcomes, this has resulted in decreased CO_2 emissions, reduced traffic volumes, increased safety and improved competition among vendors.

Often such facilities are established at the initiative of municipal governments, seeking to minimise the negative impact of goods transport on the urban environment. There are however also many examples of CLSCs operating on a pure commercial basis (e.g. to serve airports or specialised markets).

Some supply chains (e.g. supermarkets) are already operating with a high degree of consolidation and optimisation internally. In such cases adding an extra handling step (such as a CLSC), may increase costs and reduce the efficiency of delivery. In some cases CLSCs can help retailers save costs for personnel and store space, while in others this is not the case.

It is notable that many city logistics initiatives have disappeared or never made it beyond the experimental stage once public subsidies are withdrawn. CLSCs are therefore far from being a panacea for sustainable low carbon urban goods transport, but are an option that could play a positive role, not least to support the introduction of low CO_2 logistics distribution options.

4.6 Cross-cutting building blocks

4.6.1 Street network and traffic flows

The core of the urban transport system is the street network that carries the traffic of passenger cars, public transport vehicles, bicycles, pedestrians and freight and service deliveries. Through its control of the street network, a city arguably has the most important key to, at least potentially; influence both the composition, volume and 'behaviour ' of cars, vans, buses and trucks.

The street network layout and design distributes certain areas of surface between different road users. In principle the use of cars in the city can be constrained by limiting the number of arteries or space allocated to them (for example via pedestrianisation or conversion or roads to bicycle- or bus ways) while heavy traffic can be directed as required (away from residential areas, for example) by forced routes and area access bans. Often access to core areas is restricted to certain delivery hours to avoid congestion and/or local environmental problems. Parking regulations are another measure that can be used to limit or direct traffic flows to a large extent, although a city administration only directly controls part of the public parking, which may be less than half of all available parking in a city.

Speed regulations and signalling are other measures that influence traffic flows, often with the primary intention to ensure maximum flow and enhance safety, but these can also be used to control volumes that

enter the city or to improve energy efficiency. Occasionally cities would close off entire areas of the city to normal traffic in the case of sports events, political demonstrations, or environmental campaigns. Some cities impose bans on cars during serious air pollution incidents by for example restricting access alternating between odd and even numbered licence plates, thus effectively 'halving' the use of cars on a daily basis.

Thus the use of cars can in at least some areas of some cities on a relatively short notice be halved or even eliminated completely. Obviously cities could not exploit such options at random or so often that it would disturb the normal function of the city for practical reasons, but it is worthy of note that cities have such strong means at their disposal through their ability to affect local road use. This function can reduce car and lorry volumes on the network and in the city without necessarily utilising very advanced policy instruments.

More sophisticated measures to control both volumes and types of vehicles entering the city include cordon pricing, area-based charges and environmental zones. Increasingly such measures are being used by cities to regulate congestion, limit pollution or levy funds for the city to improve infrastructure. In the case of road charging it is possible (if national legislation permits) to differentiate according to the types of vehicles, where cities like Oslo and London have exemption for electric or other Ultra Low Emission Vehicles (ULEV). Environmental zones set up in, for example, many German cities have the primary purpose of keeping the most polluting vehicles from sensitive areas of the city. In London an Ultra Low Emission Zone (ULEZ), where many vehicle types need to be zero emission capable in 2020 is considered. Again the use of such instruments is constrained by national and European legislation, but limits can be strengthened over time to successively phase out older generations of vehicles, as more environmentally-friendly generations become available or required. Enforcement of LEZs is an issue.

In principle one could imagine the introduction of environmental zones in the form of ULEZ that would allow only EVs or other zero emission vehicles (ZEVs) to enter. Such zones could be gradually expanded as EVs or hydrogen vehicles became more widespread, and possibly also connected with residential areas reserved for residents with only ZEVs, or arterial roads where charging would be costly or prohibitive for vehicles other than ZEV. Today this is not an available option and the demand for ULEZs or links is not evident from an urban point of view, but it could be imagined as part of a future scenario, where transition to a ZEV fleet is well in motion.

4.7 From strategy to action

This chapter has introduced what have been termed the key building blocks and strategic areas for moving transport in European cities towards achieving the urban mobility goal. These elements emerged from the review of good practices and the stakeholder dialogue as those areas where actions need to be taken in order to significantly progress towards the goal in a way that is consistent with sustainable urban transport policies more generally.

The priorities and further specifications for action within this broad field can, however, not be defined let alone prescribed, at the general level. In the passenger as well as in the freight area more or less emphasis can be placed on the technology dimension or the activity dimension. For each building block many different options (policies and measures) exist, as well as different options for the level or strength of any such interventions. It will largely be up to decision makers and governing bodies in each Member State and in each urban area to conceive of specific combinations of appropriate strategies and measures in order to fulfil the urban mobility goal in a consistent way that accounts for broader conditions and local stakeholder preferences and priorities.

Activating the building blocks and implementing actions in order to foster real transformation of the scale required to reach the goal will necessitate a wider set of strategic processes, frameworks and facilitating mechanisms. Stakeholders engaged in the TRANSFORuM process in fact ascribed more importance to the identification and promotion of such conditions and mechanisms (innovation, dialogue, collaboration, partnership, financing, monitoring, and flexibility, for example), than to further identifying and detailing specific transport technologies, measures or interventions.

Therefore the following section will address the most important conditions and enabling factors as they were identified by stakeholders and interpreted by the TRANSFORuM consortium.

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5 Governance frameworks for change

5.1 Introduction

Chapter 4 identified building blocks that can help to achieve the White Paper goal, but it goes without saying that building blocks only become effective when they are implemented. In TRANSFORuM's stakeholder debates it was frequently highlighted that the roadmap should emphasise and concentrate on ways to ensure the introduction and implementation of more transformative policies in cities, if the urban mobility goal is to be reached. This chapter summarises the debates and observations offered by TRANSFORuM's stakeholders in this regard. The main focus is on governance frameworks and processes at the urban level, because stakeholders generally found this level to be the most important one for the needed transformation. The relevance of the national and European levels of action is addressed more in the following chapters.

5.2 Governance processes and frameworks

It was widely agreed among stakeholders that bringing local actors together and ensuring that they are pulling in the same direction is essential. This will require enhanced governance processes and frameworks to help cities formulate strong visions, adopt effective strategies, overcome barriers for action, and make significant progress in the development and implementation of solutions.

Enhanced governance is about creating ***an enabling culture*** for the activation of the urban mobility building blocks discussed in chapter 4 and for the realisation of the goal. It was argued that this is especially important in the many cities where not much progress has been made so far and where ***a culture of change*** is lacking, as some stakeholders put it. Here the main prerequisite is to create and stabilise a ***political momentum*** for change. But even in more advanced cities, broad and stable long-term commitment backed by a broad range of different actors is also needed to carry things further.

5.3 Empowering cities

The most important actors for the realisation of the urban mobility goal were seen to be city and regional level stakeholders and decision makers. Even if general technological developments, market conditions,

and national policy initiatives strongly influence urban mobility, the empowerment of cities to become drivers of transformation was seen as an important issue. "National states are becoming irrelevant", was a provocative statement from one stakeholder, "cities are where the action is", another noted. It was also discussed that there is a dependency on the political system in a country. The influence of the cities might be less strong in countries with a highly centralised political system, such as France.

Specific goals such as those in the White Paper can serve as mechanisms to create focus and to monitor progress towards a more sustainable situation. However it was argued that the goals should be debated and adapted to the local context in every city in Europe. Goals need to be connected to relevant local conditions and long-term visions in each city in a way that makes the goals more meaningful to individual cities in Europe if they are to help create momentum for change.

5.4 Integration and networking

Even if it is unlikely that there will be full consensus on which actions to take in each city, it is most important that all local stakeholders become engaged in the formation of visions and the creation of solutions to urban mobility problems. This was seen as being important in all aspects of the goal, but particularly for the city logistics element. Freight represents a significant part of the impact of urban transport, but is often not possible to 'plan for' in the same sense as passenger transport, as it is impacted more by extra-urban actors, organisations and activities. One TRANSFORuM stakeholder suggested that the city governments could work as a 'catalyst' supporting local initiatives, more than as a regulator. In particular initiatives and developments that are already underway; "bottom-up" approaches need to be strengthened".

Building networks of cities was seen as a promising approach to create the needed political momentum. Cities that share similar visions and goals, or even challenges for urban transport could benefit from joining forces under a common commitment. A question is if this can be done effectively within already existing networks (such as POLIS, EUROCITIES, ICLEI, etc.) or if new networks with a specific focus on the commitment to urban mobility goals should be envisaged. A major problem is to induce actions in cities not currently active in such networks. Could these cities be inspired to join if there is a commitment framework with clear goals for urban mobility, such as the White Paper goal? The knowledge and insight that could be derived from learning from counterpart cities would in any case be a clear benefit. One idea from a TRANSFORuM workshop was to urge Mayors to form a club of city "halflings" that agree to adopt the White Paper goal of "halving" conventionally-fuelled vehicles by 2030.

5.5 Funding and planning

It was seen as important that all cities adopt and incorporate SUMPs, taking inspiration from European level advice and guidance. Such a common framework will enable all cities to work towards a common vision in their own way. However, this planning is no guarantee in itself that cities will actually adopt more challenging long-term goals or implement significant measures in practice. SUMPs must be realised through additional incentives and initiatives if they are not to remain 'paper plans'. National frameworks and support activities could for example be helpful to translate the European guidance to the national level, and to encourage and incentivise cities to take action. This should include national incentive schemes and monitoring activities.

Another important issue is how to generate funding for change. Even if much can be done to improve urban mobility without necessarily building costly new infrastructures; new sources of funding at different scales can allow for new solutions and ideas to be realised. In some cities, not least in Central and Eastern European Member States, there is also an urgent need for investments to renew out-dated or environmentally inefficient systems. More diverse and accessible sources of funding are needed. In larger cities, congestion or road user charging is clearly a potential, yet controversial, source of revenue. Other sources of funding need to be developed and made available to smaller, mid-size and even larger cities, for example via PPPs; national incentives/grants for cities that adopt ambitious SUMPs; European Regional funds; and possibly even via unconventional or emerging means such as 'crowd funding', for new mobility innovations.

Furthermore, new and integrative business models deserve stronger support; this was an idea that was frequently mentioned by stakeholders. Flexibility is an increasingly important factor in modal choice, especially for younger people in urban areas. More and more people strive for such flexibility by using a mixture of public transport, cycling and walking, and other mobility forms that are supported by new business models. That such models may be very important for progress towards the goal can be illuminated by the example that car-sharing schemes contribute significantly to the fleet of BEVs in some European cities through schemes such as 'car2go', 'drive-now' or 'Autolib". Frameworks to promote such options should be explored and developed further to make them more accessible, integrated and user-friendly. Private initiatives and resources mainly carry out these activities. The city can take the role of catalyst to yield these 'low-hanging fruits', for example by supporting experiments and creating venues for entrepreneurs to meet.

5.6 Tracking progress in a transparent way

It was emphasised in the TRANSFORuM workshops that monitoring progress is an essential part of sustainable and efficient urban mobility management. It is also deemed important to keep track of progress towards the goals, and learn from results, evaluations and even ideas that have not been successful. Standardised monitoring would make it possible to compare and benchmark within and between cities, if similar indicators were monitored and evaluated. No common set exists today, but various options for indicators and monitoring frameworks are being explored in a range of European projects and studies. Some Member States have urban or regional transport monitoring frameworks, but there is a need for a common framework as well as guidance on how cities can develop their own cost effective and useful monitoring systems.

6 Example pathways towards the urban mobility goal

In this chapter, we formulate three different speculative urban transformation pathways towards the 2030 targets of the goal, inspired by the strong stakeholder views that there is a need to take into account in the roadmap the widely differing conditions for reaching the goal across Europe.

Each pathway – or fictive city – is described for a specific urban context that in some respects resembles ones existing in Europe. The fictive cities in pathway "Waterberg" and pathway "Viga", are already advancing to a certain extent in terms of activities to promote sustainable transport. The city in pathway "Valanov", however, is just beginning to frame its transport policy in this way and as such is considered a 'starter' city. The three pathways are to some extent moulded over the three strategic areas introduced in section 4. Waterberg is strongly heading for high shares of EVs and Viga is trying to influence a more balanced modal choice. However, rather than a separate pathway for the urban freight transport area, we integrate this aspect in each of the three cases. The main characteristics of the three cities are summarised in the following table:

	Waterberg	Viga	Valanov
Key strategy	Technical substitution: "technophilic" approach	Modal sharing: Reduce use of private cars	'Starter' pathway: Developing enabling conditions to 'catch-up' with frontrunner cities
Character-istics	Approximately 500,000 inhabitants University, local car manufacturer, low urban density Hilly, large lake	Approximately 900,000 inhabitants University, local car manufacturers, fairly high urban density Flat; sprawling	Approximately 250, 000 inhabitants No University, regional cultural centre, ageing population, no car industry, medium density Border city; very hilly
Transport system	Good public transport, tramway, cycling network, EV charging points	Good public transport, metro, cycling network	Poor bus system, no cycle lanes
Modal split (passenger)	65% drive/10% public transport/10% cycle/15% walk	45% drive/20% public transport/20% cycle/ 15% walk	53% drive/25% public transport/2% cycle/ 20% walk

Table 2: Main characteristics of the three fictive cities – Waterberg, Viga and Valanov

The differentiated fictive pathway approach has been selected for several reasons.

First of all, we use this approach to explore the implications of diversity among the 800+ cities that make up Europe. Of course, many more than three different types of cities exist and every city has its own unique context, but we found it manageable yet useful to elaborate three indicative cases, as partly representing 'extremes' in conditions and approach.

Secondly this allows for exploring how, despite differences, the strategic 'building blocks' for action, and the enabling factors identified in the previous chapters can be applied in different ways, and in multiple combinations, to take account of this diversity, and yet reach towards the same goal.

Thirdly stakeholders who willingly joined in the exercise of exploring and animating fictive cities found the approach useful, and through this process, found a quick route into debating the strategic scope for fulfilling the goal. Paradoxically, perhaps, the fictive setting actually contributed to enter realistic deliberations of how to fulfil the goal. We hope it can serve a similar purpose here.

Each pathway description follows the same format: After a brief introduction, an outline of the 'problems' encountered in the respective city, the 'policies' it has decided to adopt, and the 'politics' that has characterised its process of deliberation and decision making are discussed, reflecting internal as well as external factors. For the two 'advancing' cities, speculative benchmark targets on the way towards the 2030 goal are also included, indicative milestones are offered for the 'starter' city.

6.1 Technology substitution pathway: Waterberg

The city of "Waterberg" has embarked on a pathway towards an interpretation of the goal that mainly emphasises ambitious technological advances. The primary element of such an approach revolves around the idea of substituting (i.e. replacing) conventionally-fuelled vehicles with BEV and PHEVs (Figure 4).

The city of Waterberg has adopted what academics from the local university call a "technophilic" approach to tackle their mobility problems. This term denotes trust in the ability of science and technology to deliver long-term solutions to most problems. In fact, the report that kick-started the strategic initiative of the city had the title ***"From problems to opportunities."*** This indicates that every challenge bears the potential to spark innovation and, in turn, to trigger economic growth. The core of Waterberg's system of innovations is EVs. Individual car ownership is considered sacrosanct in Waterberg, partly due to the long-standing presence of ***Clarvil*** in the city, a car manufacturer that provides a significant number of local jobs. Car-sharing, public transport, cycling and walking are also considered as important complimentary aspects

6.1.1 Waterberg in 2014

With its 500,000 inhabitants Waterberg is surrounded by picturesque scenery – rolling hills whose slopes continue into a sizable lake (hence the name). It is therefore located in a large geomorphological sink, which tends to prevent pollutants from escaping this natural trap, especially in so-called "inversion" weather conditions, which occur frequently in this part of the country.

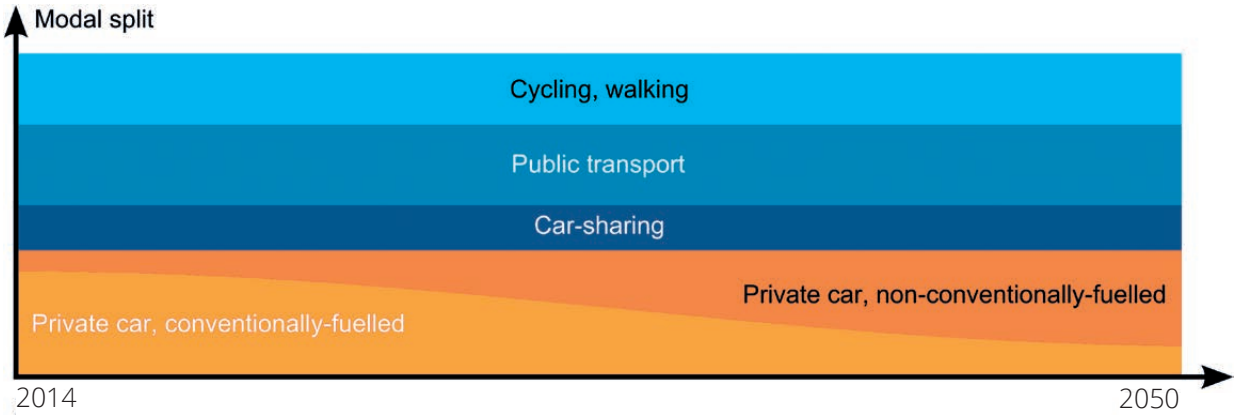


Figure 4: Imagined pathway for fictive city "Waterberg"

Emissions from cars, especially diesel cars, are the main culprits of this situation, which causes severe respiratory problems for large sections of the population. Also the historic buildings in the city centre suffer visibly from damages caused by emissions (and vibrations) of cars.

The "***Breathe again***" promise of the leading political party is therefore often mentioned as an important factor for their success in the recent local elections.

This official pledge for action to improve the local air quality correlates with national commitments to reduce the CO_2 emissions 60% on 1990 levels over the next 35 years; a goal which can only be reached if the transport sector delivers significant reductions. In addition, the population of the province in which Waterberg is located is known for its pro-environmental attitudes, which explains the regional government's recent and widely-supported decision to aim for energy autonomy by 2050. Given the availability of hydro energy in artificial lakes between Waterberg's hills and thanks to the vast agricultural areas in the flat hinterland, this aim is not entirely unrealistic. This pro-nature position of many people in the area does not, however, translate into enthusiasm for cycling or walking as a means for their daily commute. Inclement weather and the hilly topography are often cited as reason for this.

The majority of citizens in and around Waterberg are highly educated. Generally speaking, Waterbergers tend to be quite technology savvy with high adoption rates of smartphones, "intelligent buildings" etc. It is therefore not surprising that the recently launched Smart City initiative – an element of the "from problems to opportunities" strategy – of Waterberg's administration enjoys a very positive reception from the local media and citizenry. Many people hope that related efforts would contribute to a reduction of the city's congestion levels, which can become considerable during rush hours. The relatively low urban density allows the 'pain-boundary' of the congestion problem to be pushed a few years into the future because space has recently been allocated for a new highway-bypass around the city. The situation on a frequently clogged-up thoroughfare across a residential area near the inner city is expected to be relieved soon with the opening of a 500m long elevated road over a notorious intersection. During the planning phase of this vertical bypass, residents protested massively against the expected 'noise avalanche' in front of their windows. The local government countered with the promise to boost the introduction of silent cars.

There are several favourable conditions to electrification of vehicles at the national level. Hydro power and biomass have already been mentioned. But certain political incentive structures support the same goal. For example, the national tax rates on buying and owning 'conventionally-fuelled' cars are high. Taxes on EVs, however, are very low; even to the extent that related policies have been challenged at the European level as hidden subsidies. In any case, since economic and practical considerations are the most decisive factors influencing people's purchase decisions, the current national framework has already stimulated a ten-fold increase of EV sales over the last five years. Despite noteworthy socio-economic differences within the city, the majority of the households can afford to buy a car. Given the powerful incentives, the total cost of ownership of EVs is as affordable as 'conventionally-fuelled' cars.

6.1.2 Policies

For many of the abovementioned reasons, the electrification of Waterberg's vehicle fleet was communicated as 'natural' solution. As part of the "from problems to opportunities" approach, an "EV FORUM" was created. In the beginning it served as communicative platform for stakeholders in the city and also included some politicians from the national level. Meanwhile, it has a steering committee that is strongly linked with the city administration. The committee coordinates the activities to boost electric mobility in Waterberg. A joint communication strategy was approved. It argues that electric mobility would please the residents along the new flyover, solve air quality problems, boost the growth of Clarvil's recently introduced eCar series, provide research opportunities for scientists at the Universities' engineering departments, help achieving CO_2 reduction targets and reduce the dependence on oil imports. In addition, they would expose Waterberg to international media attention for its lighthouse character. In a few years, it might even attract considerable numbers of affluent technology-tourists, conference attendees and educational site visits.

The EV FORUM further pushed for incentives to make EVs an affordable alternative to 'conventionally-fuelled' cars. Increasingly attractive legal frameworks at the national level have regularly stimulated these local initiatives. Such incentives include:

- Free access through toll cordons for EVs;
- Free access to ferries;

- Exemption from VAT;
- A national fund that provides grants and advice for pilot and demonstration projects that encourages new and future-oriented sustainable mobility solutions.

Importantly, the national government also has provided the legal conditions for cities to take much more ambitious actions on a voluntary basis. Since the last elections, two years ago, Waterberg has seized these opportunities by introducing:

- A complete exemption for EVs from local parking fees;
- Access to bus lanes – even during rush hours.

In addition, together with the EV FORUM the city has joined forces with an advertising company to build hundreds of EV charging points throughout the city. The funding arrangement behind this is simple: The company pays for the infrastructure in exchange for the right to display advertisements on each charging station – and on major other billboards. Depending on this arrangement's success, plans are under way to lift it to the next smarter level in the coming years. Each charger would then be able to recognise the car and its user's driving patterns (allegedly without utilising the driver's identity) and display tailored advertising. Data protection issues have yet to be addressed for such plans.

	2010	2015	2020	2025	2030
Share of full EVs or hydrogen FCVs in mainstream new car market	1%	7%	20%	30%	60%
Funding/financing	National public fund	Local public funding scheme for private initiatives of good 'green' concepts	Continuation of funding schemes	Continuation of funding schemes	Continuation of funding schemes
Roll-out of charging points	One private charging point for every EV and some public charging stations	Every new house/building has a charging point			
Share of transport-related public procurements that require 'green' fleets (EVs or other alternative fuels)	20% in public transport fleet, 80% local health services and 30% waste collection	30% in public transport fleet, 90% local health services and 30% waste collection	50% in public transport fleet, 100% local health services and 70% waste collection	80% in public transport, 100% health services and 100% waste collection	100% in all local sectors
ICTs supporting EVs		More use of ICT for efficiency improvement in the freight sector			A multimodal transport information, management and payment (MIMP) system
Share of urban freight services delivered by EFVs	5%				50%
Indirect measures	High fees and taxes on	Increasing parking and toll cordon fees for 'conventionally-fuelled cars' in the city centre			

Table 3: Milestones adopted in Waterberg

The city itself is planning to phase out conventionally-fuelled vehicles from its own fleet over the next ten years, when the existing leasing contracts and tenders expire, and to gradually replace them with 'green' vehicles. Part of the bus fleet is also expected to run on electricity in near future. The first two such vehicles have recently been introduced. One of them has massive on-board batteries and can easily propel the bus on one full route from the depot and back. At the end of this circuit it has to stop for two hours any way according to the current timetable. Alternative fuels, and in particular electromobility, are becoming increasingly used in urban freight in Waterberg. Increased driving range and increased load capacity of vehicles in the next few years thus represent a significant potential for emission cuts. The city is lacking in the necessary means to enforce freight operators to follow suit. Together with the EV FORUM Waterberg has therefore initiated a network of freight operators, where barriers and opportunities are discussed and aimed at being resolved. An incentive for freight operators is that the city offers access to extended delivery times to EFVs (today, delivery time in the city centre is restricted to early morning and evenings).

Moreover, given the increasing recharging infrastructure, the national postal service has chosen Waterberg as a pilot case for the electrification of its vehicle fleet. At the moment, 40 hand-pushed but electrically-supported carts for mail workers are in operation, 20 mail delivery bicycles and 10 vans. Once the question where and how these vehicles can be recharged has been answered, the postal service aims to go 100% electric in about 5 years. Also other delivery companies are experimenting with similar strategies and hope to substitute their fleet of – mostly diesel-fuelled – vans and lorries with EFVs.

The city plans to further improve the infrastructure, both with regards to improving the bicycle network, stimulating increased use of e-bikes and more charging points, in particular quick chargers.

Together with the EV FORUM Waterberg has developed and adopted a mini-roadmap with specific milestones (see Table 3).

As Waterberg is a high-tech city, there could be more ITS, or new techniques such as GPS data collection, etc.

6.1.3 Politics and governance frameworks

In Waterberg there is already a strong commitment to foster electric mobility. There is not much political opposition, as EVs are a concept that all the political parties can accept, the EV FORUM is a solid integrative platform. However, as bus lanes are increasingly congested due to the many EVs, opposition has arisen. Some members of the local "Alliance for Nature" (which is actually integrated into the EV FORUM) regularly raises the issue that EVs will not solve, and may possibly even worsen, congestion levels and that the liveability of the city continues to suffer from any vehicles' high demand for space, both for roads and parking. Recently, similar concerns are raised by Waterberg University's student union, which fears that cyclists who used to move relatively freely on bus lanes will soon be in danger of thousands of silent "stealth" cars sneaking up on them from behind. Moreover, there are certain issues regarding calls for EV fleets in public procurement processes due to technology neutrality. There are local pressures on the national government to ensure that tax exceptions and other measures will also be granted for larger vehicles such as buses. This is an important factor for the approval of the new procurement rules in the city council, as otherwise it is expected that the budget will increase, creating conflict with other sectoral interests.

6.1.4 External factors

While politicians and stakeholders in the city have primarily promoted several of the measures, the technology substitution pathway depends very much on market developments (e.g. technological innovations) and national framework conditions (e.g. vehicle and fuel taxation). At national level tax incentives and exemptions from charges have been effective in providing the additional boost needed for mainstream consumers to choose EVs. At local level access to parking and provision of infrastructure are important measures. However, such local incentives often require multilevel agreement, as parking regulations at national level have to allow for exemptions for EVs, although implemented locally. Currently, the Treasury is likely to oppose any further reform that involves loss of income (i.e. exemptions from taxes).

Also EU legislation is important in this regard. For example, the city has discussed introducing electric-drive-only zones; however, there is an on-going discussion at local and national level as to whether EV zones are in conflict with EU legislation on non-discrimination of technologies. No political party has therefore promised to implement this measure, but the small anti-EU party is experiencing increased voter support, arguing that the EU does not respect subsidiarity and should stop limiting Member States in supporting certain technolo-

gies. This party is in favour of steering the tenders in the direction of EVs; thereby also supporting the local car manufacturer and local jobs, such a choice is disputed due to technology neutrality.

6.2 Modal sharing pathway: Viga

The city of Viga has embarked on a pathway towards an interpretation of the goal that mainly emphasises changes in the use of vehicles. In Viga, the focus is on shifting away from strong dependence on individually-owned and -operated passenger cars, vans, and trucks towards more reliance on other forms of access, transport modes, and vehicle usage patterns (see Figure 5).

The strategy involves measures for compact urban development, promotion and integration of public transport, cycling, walking, car-sharing, and ride-sharing – and measures to manage urban freight and delivery flows. These measures continue and reinforce Viga's already established practices in those areas, but combine them and take them to higher levels. Cleaner vehicles and fuels are also promoted as part of the strategy but the city is more focused on the demand, behaviour, and culture of mobility, which it aims to influence and optimise from an urban quality of life perspective.

6.2.1 Viga in 2014

About 900,000 people live in Viga. The city is characterised by relative affluence and significant growth, but despite long standing urban planning policies to accommodate expansion and agglomeration, the city currently faces a broad range of challenges from the associated transport and mobility pressures. Large flows of commuters travel into the city daily, but also increasingly between sub-centres and areas across the wider region. Central city dwellers and students appreciate the urban lifestyle and amenities but also demand high mobility and independence. Travel for leisure, tourism and events is on the increase, much of which is undertaken in individual cars, rentals and taxis, in addition to tour buses. Viga has an old metro network that is comparatively small and often crowded.

Diverse fleets of trucks service the retail sector that is relatively decentralised across the city, but these are vastly outnumbered by streams of vans providing '24-7 door-to-door' deliveries and home services purchased online by a population enjoying near 100% coverage of high-speed broadband access. As a consequence of these trends, Viga is ever more congested on both the road and rail networks, as well as experiencing levels of air pollution and noise that exceed health and environmental standards. Its vulnerability to steeply rising fuel cost sometimes appear in the Lord Mayor's nightmares of a future ghost city.

The market for alternatively-fuelled cars and trucks is currently very small, as they are not economically competitive. There are two car manufacturing companies located in the Greater Viga metropolitan region but they do not offer non-conventionally-fuelled models. The electricity supply in the region is mostly coal-based and is not controlled by the city.

The city and its surrounding region have relatively modern road, rail and pathway networks that are undergoing further expansions, but each new extension is quickly expands to capacity in peak hours. The costs to build and maintain further new infrastructure is rapidly rising because of the competition for space and also for the need to build in resilience to climate change, increasingly severe weather events and natural disasters.

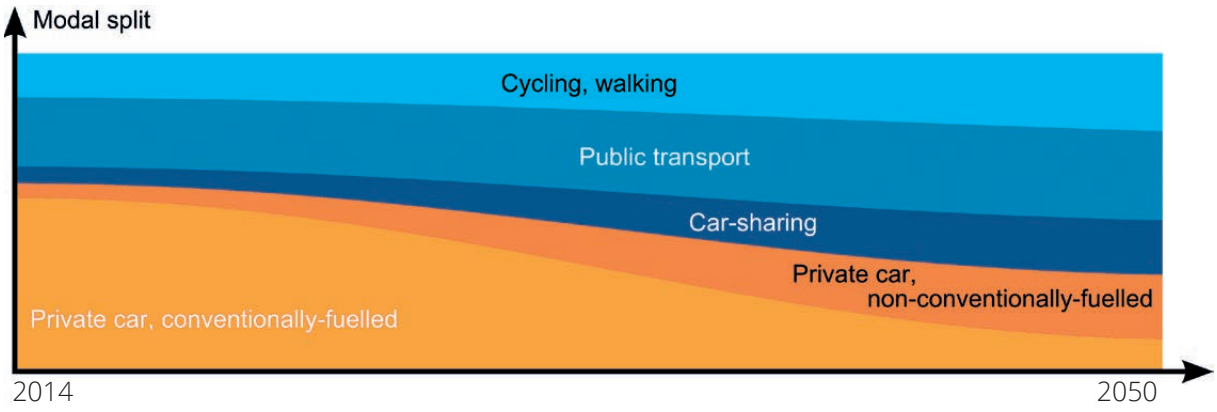


Figure 5: Imagined pathway for fictive city "Viga"

It has been realised that Viga cannot accommodate further growth in citizenship, employment, commerce and tourism if it continues to rely predominantly on conventionally-fuelled passenger cars, vans and trucks. Yet it is also realised that the city cannot maintain its attraction, economic performance and quality of life either if it fails to provide frequent, flexible and smooth mobility for the majority of the population and business. In addition, current transport patterns represent the clearest challenge to fulfil its commitment to become a low carbon city as part of an international network of frontrunner cities. A widely shared long-term strategy is needed to overcome these challenges. However, it has long been a problem for the city's different municipalities, jurisdictions and different public transport companies to come together and collaborate on devising a coherent strategy on urban mobility.

6.2.2 Policies

In 2014 Viga successfully formulated a joint vision and a long-term strategy for urban mobility in support of an economically, socially and environmentally sustainable future towards 2030 and 2050. The strategy incorporates an interpretation of the European Transport White Paper goals for urban mobility by aiming to halve the use of conventionally-fuelled, owned and operated vehicles by 2030. The strategy was developed through the following efforts:

- A broad collaborative effort involving all municipalities and jurisdictions in the city region, concluding with a governance reform which created a unified strategic collaborative framework with harmonised rules, procedures, goals and funding schemes;
- A wide stakeholder engagement process, including all stakeholder groups with an interest in mobility including providers, organisers and innovators of transport and mobility services; businesses involved in urban commerce, freight and logistic services; representatives of citizen organisations and other NGOs; and many others – from school children to marketing companies to rock bands;
- An extensive analytic effort involving universities, research centres and private consultants to improve the data and knowledge base – in particular for urban freight – and to review and prioritise potential policy measures to fulfil the 'halving' goals.

A joint SUMP process provided a procedural framework for connecting the three abovementioned efforts and the subsequent joint SUMP document encapsulated many of the outcomes of these processes, such as goals, strategies, indicators and outreach.

The process identified the following nine packages of measures that have been adopted as part of the long-term strategy and plan:

1) A **congestion charging scheme** with two rings, initially with payment for all vehicles only in morning and afternoon rush hours and with exemptions for public transport, and rebates for registered car-sharing members, and EVs (free if combined). Net income is to be recycled for transport projects in support of realising the SUMP.
2) A **comprehensive parking strategy** including introducing parking fees along the public road network, charging residents for parking permits, and taxing free private parking. Net income from parking fees is recycled for transport projects in support of realising the SUMP.
3) **Access restriction zones** for the whole city area based on a staged model for the concept of ***conventionally-fuelled, owned and operated vehicles.*** The most restricted area in the city centre is totally car free; the second most restricted areas only allows EVs operating in a certified car-sharing scheme; a third level areas allow only shared cars, but even conventionally-fuelled ones; a somewhat similar zoning applies to freight with privileged access for vehicles travelling from the CLSC, and/or EFV (see measure 8).
4) A comprehensive **public transport programme** including an integrated zoning and ticketing system, a joint smart card/mobile phone payment platform, a coordinated and a prioritised investment strategy for public transport infrastructure (including 4 BRT lines), supported by a common strategy for bus right-of-way. There is joint goal that all public transport vehicles will be CO_2-free (meaning electric with green certificates) before 2030. An extension of the metro is planned but will take 10–15 years before it is fully implemented.
5) A **location development policy** restricting the development of housing and office buildings above a certain floor area to zones within 500m of rail or metro stations. Some exemptions are allowed, but these are gradually phased out over the coming decades. Location away from such zones requires that the property owners establish and maintain approved mobility management services or pay higher property taxes.

6) A **programme to support and promote car-sharing and ride-sharing** via preferential treatment in congestion charging, parking; access restrictions, and urban development schemes. There are subsidies for younger citizens (under 35) joining a car-sharing scheme. The two local auto manufacturers are conducting social experiments with new mobility services and joint ownership models as alternatives to conventional car ownership; these kinds of experiments are supported city's research programme. Car-sharing is strongly linked with public transport; a smart mobility card allows for access to public transport, car-sharing, bike-sharing and taxis.

7) **A cycling and pedestrian policy** that provides extensions to and ultimately completion of the city-wide network of pathways, including 25 bicycle bridges and flyovers, 10 regional super cycle highways and three covered (all year) cycle routes though the city. Extensive cycle parking facilities and (advanced e-bike) sharing services at all railway stations will be offered alongside free bikes on all trains and even dedicated 'cycle buses' in the BRT corridors. Students are to be offered a 50% local government subsidy if they purchase an e-bike with a green certificate and forgo obtaining a driver's license.

8) The **city logistics package i**nvolves the construction of three CLSCs for different types of freight going into the city. The CLSCs offer a range of logistics services to users, operating under commercial conditions; CLSC vehicles have privileged access and curb side rights in the city. There is an authorisation scheme for van delivery services that privilege companies using EVs and green certificates.

2010 (Baseline)	2015	2020	2025	2030
Private car	Stabilise modal share of private cars	Modal share of private cars is below 35%	Modal share of private cars is below 30%	Modal share of private cars is below 25%
Quality of public transport	High quality public transport 500m away from 90% of dwellings	High quality public transport 400m away from 90% of dwellings	High quality public transport 300m away from 90% of dwellings	High quality public transport 250m away from 90% of dwellings
Car-sharing	Car-sharing option less than 500m away from 50% of dwellings	Car-sharing option less than 400m away from 60% of dwellings	Car-sharing option less than 300m away from 75% of dwellings	Car-sharing option less than 300m away from 90% of dwellings
Cycling	Cycling network increased 10% from baseline	Cycling network increased 15% from baseline, 5 bridges 3 super links complete	Cycling network increased 20% from baseline, 10 bridges 6 super links	Cycling network increased 25% from baseline, all bridges and super links
Access to public transport	60% of new offices and housing located less than 500m from rail/ metro station	70% of new offices and housing located less than 500m from rail/ metro station	80% of new offices and housing located less than 500m from rail/ metro station	90% of new offices and housing located less than 500m from rail/ metro station
Driving	20% of inhabitants under 35 subscribe to car-sharing or have no driver's license	40% of inhabitants under 35 subscribe to car-sharing or have no driver's license	60% of inhabitants under 35 subscribe to car-sharing or have no driver's license	80% of inhabitants under 35 subscribe to car-sharing or have no driver's license
Urban logistics	10% of retail uses CLSC; 5% delivered by 'CO_2-free' vehicle	15% of retail uses CLSC; 10% delivered by 'CO_2-free' vehicle	20% of retail uses CLSC; 15% delivered by 'CO_2-free' vehicle	25% of retail uses CLSC; 20% delivered by 'CO_2-free' vehicle
Public transport fleet	60% of public transport fleet is 'CO_2-free'	75% of public transport fleet is 'CO_2-free'	90% of public transport fleet is 'CO_2-free'	100% of public transport fleet is 'CO_2-free'

Table 4: Milestones adopted in "Viga"

9) **Infrastructure for EV charging** is to be supported by, but not forced by the city. The preference is to The city has facilitated the deployment of pick up point network; the plan is to allow authorised delivery services to use these points. The city has established the Urban Freight Partnership as a forum for collaboration. mostly let market actors experiment and offer solutions. To get any kind of support from the city a charging system has to be based on green certificates. The city will procure EV mobility for its own transport on an ad hoc basis.

These are the packages of measures that were adopted in the context of the city-wide collaboration and the SUMP. Adoption of additional packages and adjustments to the existing ones are foreseen in the future, with major revisions at regular (5-year) intervals, as deemed appropriate following review. Indicators and milestones for progress have been adopted.

Viga in 2014 has adopted a mini-roadmap with milestones along on the way towards the goal as shown in Table 4.

6.2.3 Politics and governance frameworks

To be able to implement the plan and make actual progress towards the goal there is a number of political factors and wider governance issues that are important for the city. Some political factors concern the internal relations within the city while others relate to outside actors, higher levels of decision making or overarching framework conditions.

First of all it is difficult for Viga to create and maintain **political consensus** and wide stakeholder support to such a radical goal that challenges the role of the conventionally-fuelled car in the urban economic system and everyday life of citizens, given the popularity of cars. To maintain the vision of a modal sharing approach towards halving the amount of cars, there first of all has to be credible and attractive alternative forms of access and mobility available or in the pipeline. But available alternatives may not be equally appealing to all, and the drawbacks may appear more evident than the benefits to many. In this city a wide majority were in support, but it is fragile.

The **sharing of cars** is a promising alternative, since it does not fundamentally alter the 'gestalt' of the car as provider of fast, comfortable and flexible mobility. This is why this city puts so much emphasis on this alternative in its pathway. Car-sharing may however also have its downsides and limitations; first of all it may compete with public transport or cycling; with back-to-base models, as opposed to point-to-point sharing, car-sharing schemes also do not offer exactly the same flexibility as car ownership at the current time, but this will change as demand increases. It may also in some circumstances act more as a bridge towards full car ownership than de-escalation from it. However, pursuing the modal sharing approach towards the 'halving' goal will put a pressure on the local political system; a strong charismatic leader and a strong local culture (e.g. citizens depicting themselves as 'mobilists' rather than 'car owners') may be important elements. Also the wider (national) political and cultural framework may be important.

In terms of the individual packages and measures in the city's programme, **congestion charging** is controversial. It is a potentially powerful tool to influence the use of cars as well as to generate revenue to support alternatives. It is regularly assumed that a congestion charging scheme is more effective and acceptable if it is a part of a wider package that also provides alternatives (public transport etc.). However, Viga struggles to achieve acceptability. Congestion charging can be introduced as there is national legislation that endorses it, and strong evidence from research that it is socio-economically efficient. Viga has already conducted a trial where the advantages became evident for many citizens and businesses.

City logistics is one of the measure packages where local action and agreement is particularly important. In many cities urban freight policy has a mostly reactive approach, emphasising restrictions for noise or safety reasons only. Viga has adopted a proactive approach, where the different actors (e.g. retailers, forwarders, carriers and the municipality) formed a partnership that works together to identify solutions to local conflicts and also plans ahead of major events. It started out as a relatively weak, heterogeneous network. Through different efforts it has managed to become an important advocate for radical visions and policies. In Viga, local stakeholders have not driven this radical transition alone, but their support was necessary in order for it to occur.

6.2.4 External factors

While Viga's pathway is mostly focused on strategies and measures that can be pursued at the local level by the city itself, there are nevertheless many external factors that would be important for the feasibility and success of the modal sharing approach.

As already mentioned, **legislation** allowing for measures such as congestion charging, access restrictions zones, parking charges, and possibly preferential treatment of 'green' vans, trucks and cars within various programmes is a necessary precondition. The city was able to secure and influence part of the revenue for urban transport investments, including the cycling infrastructure projects.

Another more general aspect is the **funding** for investments in alternative modes and subsidies for various incentive schemes. Investments in urban transport systems (e.g. increasing public transport service level or building infrastructure for 'green' modes) influence travel behaviour and attract travellers, but require large sums beyond what the city budget can sustain. Even with some income from congestion charging, tolls and other funding sources such as national government support, there is a need for private resources. The national government provides transfers to cities that adopt particularly visionary or effective SUMPs. It has, however, not secured funding from the European structural funds or loans from the European Investment Bank (EIB) that are available on similar conditions for other cities.

Car-sharing may to a large degree be seen as self-financing or market driven. Cities can support it by providing parking spaces and various forms of preferential treatment to, for example, shared EV systems, and other subsidy schemes as adopted by the city. This may be an area that is not as dependent on outside factors (apart from marketisation of software and other technologies that facilitate its operation) as some of the others and could be driven by more bottom-up processes and price mechanisms. Therefore Viga has not been able to 'force' such a strategy towards a specific goal, but is contributing to facilitating car-sharing in different ways. The national government also supports the proliferation of the car-sharing companies by revising company car taxation rules that tend to favour the conventional car.

Finally cities to some extent depend on and **compete with each other**. Radical strategies with substantial interventions to reduce individual vehicle use without similar measures that are taken in other cities accrue considerable risks. If the strategy will 'scare' citizens and business away, the city may suffer and lose in terms of competitiveness and quality of life. On a local scale, strict location policies, parking restrictions and other measures may induce shoppers to visit other neighbouring cities instead. Such anxieties (real or imagined) often discourage city governments to pursue policies significantly more constraining than others. In the case of Viga, the contemplation was the opposite: exactly through the shift away from car dependence the city thrives and prospers, and experiences an improved quality of life. Yet it is to some extent a gamble. Cities would be much more likely to continue to pursue such strategies if they could do so jointly, partly to lower the risks of economic backlash, and partly to allow cities to learn from each other.

6.3 'Starter' pathway: Valanov

The following account describes the situation of and measures being undertaken in the city of "Valanov". The city has embarked on a pathway towards an interpretation of the goal that takes into consideration its context as a smaller and less affluent city.

6.3.1 Valanov in 2014

Valanov has a population of 250,000. Its main characteristics are an old but heavily utilised public transport system, a high number of private cars and a limited amount of walking and cycling, partly because the hills around the city deter people from active travel. Therefore, incremental changes are planned in the city, mainly to improve the efficiency and maintain the patronage of public transport, to improve the infrastructure for walking and cycling and to promote alternatively-fuelled private cars amongst residents and commuters alike.

This strategy involves measures to limit sprawl outside the city's core area, efforts to integrate multimodal journey management, as well as activities to manage urban freight and delivery flows more efficiently. Most of these measures are relatively new to Valanov and require not only investment from the city authority but also public buy-in. Also new PPPs will be required

to facilitate and fund efforts to grow momentum for modal shifts and to pilot alternatively-fuelled vehicles. In order to benefit from international exchange, Valanov actively seeks involvement in various European projects to learn from and share experiences with other cities across the continent. It also realises that a truly complex challenge requires a truly systematic approach and therefore, the city council recently adopted a resolution to develop a comprehensive SUMP according to the established guidelines of the European Commission.

ing. The city is a regional centre for culture, but only attracts limited visitors on the back of these cultural offerings. Therefore, Valanov is pursuing a policy to promote jobs and growth in the city centre to encourage younger citizens to stay in the area.

Being close to an international border, the city also receives significant throughput of both national and international passenger and freight traffic and measures are being discussed to manage the environmental problems caused as a result of this location. The majority of freight transport arrives via truck, al-

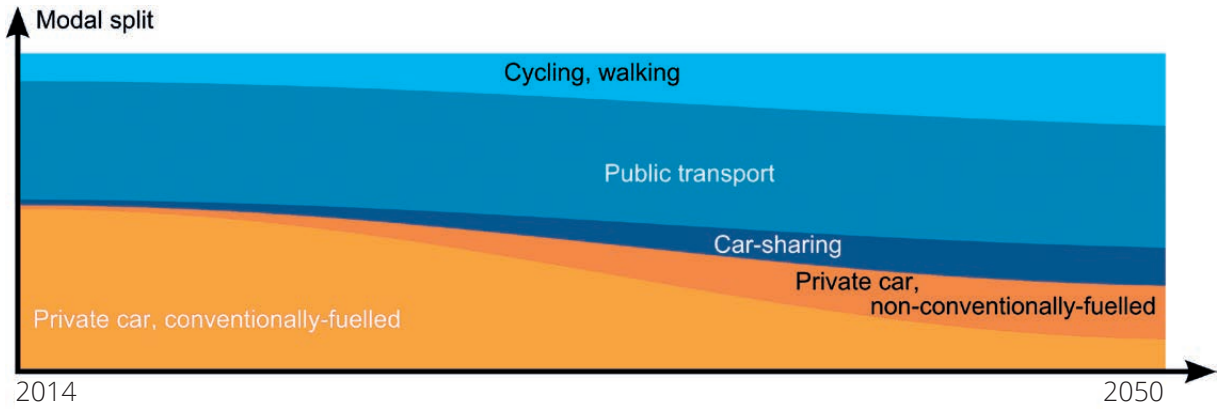


Figure 6: Imagined pathway for fictive city "Valanov"

6.3.2 Problems

Following a transition to a market-based economy, Valanov has experienced significant growth in private car ownership and use over recent decades and suffers consequently from high levels of congestion, air and noise pollution and inadequate parking provision. Walking and cycling infrastructure is limited and somewhat poor where it does exist. Public transport systems are old and underfinanced and public perception regards transit as an outmoded and old-fashioned means of travel. The city has no light rail system, but its ageing bus fleet is made up of both trolleybuses and regular buses. Valanov's taxi fleet is also run privately and for most companies the cars are very old and run on petrol. Increasing suburbanisation and sprawl of residential areas over the past 30 years has led to a dispersed wider urban area, which makes it difficult for public transport routes to cover it adequately. Spatial development management is a priority for the city over the next 15 years. Valanov has no University, so the population is fairly stable, but age-

though Valanov is situated on a tidal river and has a small port.

As a consequence of this situation, Valanov continues to experience growing congestion on its road network, as well as levels of air pollution and noise that exceed health and environmental standards. Significant new road infrastructure is not expected during the tenure of the currently elected Mayor.

The market for alternatively-fuelled cars and trucks are currently very small, as they are not economically competitive now or in the foreseeable future. Nevertheless, there are currently two EV charging spots in the city. There is no car manufacturing in the area or the country for that matter. The electricity supply in the region is mostly coal-based, though there is potential for hydropower to be exploited using the river and the city is currently investigating the feasibility of this option. Small-scale wind power initiatives have started to emerge in the last five years.

Valanov has identified the need for an overarching strategy to manage and upgrade its transport networks, with a cohesive and long-term view. The city is divided into different local authorities and its public transport is managed via a central city-governed agency, although there are also private bus companies operating in the area that have little engagement with the transport agency. Each local authority in the city manages local roads and parking and the different public transport companies collaborate only to a rather limited degree.

6.3.3 Policies

In 2005, Valanov formulated a new overarching spatial development strategy, designed to limit sprawl and increase the economic potential and competitiveness of the city. Reducing congestion was one priority measure within this strategy. In 2010, this vision was broadened to incorporate more emphasis on environmental protection. Walking and cycling received greater political prominence and a significant investment was allocated to the upgrade of the public transport infrastructure, mainly to improve services and to modernise the fleet. The strategy now concentrates on the following areas:

- A new governmental partnership between the central city administration and the local authorities to enable better coordination on road management within the city;
- A wider platform for collaboration, bringing together stakeholders including the private bus companies and the taxi companies to offer more integrated transport generally, but with a specific focus on considering options for more fuel efficient and alternatively-fuelled vehicle procurement within the wider city-based fleet (both public and private);
- A freight group was established to understand the feasibility of opening a series of CLSCs on the peripheries of the city to minimise through traffic;
- A public engagement process was set up to understand public attitudes to walking, cycling and how to improve perspectives on public transport. This will feed into the public transport platform;
- The Mayor set up a new Sustainable Urban Visions team within his office to oversee the development of the strategy. This aims to connect the officers responsible for transportation, planning and economic development and environmental protection in the city.

In 2014, the city decided to integrate the progress so far into the more systematic SUMP activities. A final version of the SUMP document is expected in the middle of 2015. Valanov is keen to engage in partnerships with other European cities, perhaps more advanced on realising sustainable transport goals in order to learn from their experiences.

The main short- to medium-term activities currently underway are as follows:

1) **An overhaul of the bus network:** The entire public fleet of buses will be upgraded. This will be an eight-year project, which will start with the most heavily used routes. Twenty new CNG buses will be bought for these routes. For the remaining diesel fleet, particle filters will be installed and a 30% blend of biodiesel will be used to fuel the buses. Residue waste corn stocks from the nearby agricultural production will be used to manufacture the blend, providing an important new industry and jobs for the surrounding communities. In addition, all of the city's trolleybuses will be electrified and a new sub-station will be built to enable new trolleybus routes to be introduced to better link the outer suburbs to the rest of the city's public transport network.
2) All buses and trolleybuses will run later in the evening following the introduction of a new time schedule and 80% of bus lines will have buses running at least every 20 minutes, with the most frequented routes offering 10 minute services.
3) **New parking guidelines:** Valanov will work with the local authorities to produce and implement guidelines to standardise and improve the on- and off-road parking infrastructure in and around the city. Whilst the parking infrastructure is being standardised, applications are being made for funding to invest in car park-based EV charging and a public partner for car-shar-

ing trials is being sourced. This scheme will operate out of the designated bays set aside for car-sharing in the new parking guidance.

4) **EV taxi pilot:** Through the new city partnership, a consortium of the local taxi operators, together with the city transport agency, is taking part in a four-year European project to enable the procurement of EVs and charging infrastructure for the city. EVs will operate at reduced tariffs compared to conventionally-fuelled vehicles and charge points will be located at specific taxi ranks and at key points throughout the city, such as the train station.

5) **Smart cards:** Once the public transport upgrade has started, the introduction of a new smart card will be introduced to the city, offering hassle-free payment to all. Regular commuters, youth and elderly passengers will be entitled to discounted fares.

6) **Cycle training and infrastructure:** A new cycle route along the river will be developed to link the North and South areas of the city and to provide a quick and reliable alternative to the congested road corridor for cyclists. A separate lane will be introduced for cargo bikes to carry goods from the new CLSCs (see below). Cycle lanes will be introduced throughout the city to form a network on the city's existing roads. Free cycle training for adults will be provided and cycle training for school children will be introduced. A new e-bike-sharing scheme will be installed with eight bikes in the hilly area of Valanov,, near the main park, for leisure and commuting. This landscape was identified during the initial public engagement activities as a barrier and e-bikes were a key recommendation, for which the city authority allocated funding to deliver. The success of the scheme may lead to further car- and bike-sharing in the city.

7) **Personalised travel planning** will be offered to up to 5,000 households to encourage new users of public transport and cycling. This will be part of a wider engagement campaign following the launch of the new bus network and the smart card system.

8) **CLSCs:** Through the establishment of a long-term PPP, one or two CLSCs will be constructed to manage freight going into the city. The idea is to frame the first CLSC as pilot project and to acquire European or national funding. A series of EFVs and cargo bikes will be procured to manage the delivery of goods to the city centre. These vehicles will have privileged access and curb side rights in the city. In addition, the CLSC will also be designated as the location to manage outward flows from the city and Valanov council will also invest in ensuring that council and municipal waste will be managed through the CLSC.

The City has agreed to use the following mini-roadmap with milestones as points of orientation for urban policy:

2015)(Baseline)	2020	2025	2030
Use the initial SUMP document to push-start political moment	SUMP established and 20% of SUMP measures implemented	60% of SUMP measures implemented	SUMP fully implemented
Create a network of medium-sized starter cities	10 Member cities	20 Member cities	30 Member cities
Reduce car usage	40% of trips by car	35% of trips by car	30% of trips by car
Charging network for EV and e-bikes	50 points	200 points	500 points
Cycle network and promote cycling	10km new network	15km	20km
Smart Card	30% Personal transport customers	50% Personal transport customers	80% Personal transport customers
CLSC funding acquired, business plan approved	Successful pilot CLSC up and running		2nd CLSC fully operational

Table 5: Milestones adopted in "Valanov"

6.3.4 Politics and governance frameworks

A number of political factors and wider governance issues are important for the city as a precondition to implement these plans and to make actual progress. Some political factors concern the internal relations within the city while others relate to outside actors, higher levels of decision making or overarching framework conditions.

First of all, it is difficult for the city to create and maintain **political agreement** and wide stakeholder support to invest in a public transport system that is regarded by many in the city as obsolete in times of affordable automobility for all. Cars are widely perceived as the most flexible and convenient all round means of transport for modern complex mobility patterns for both private households as well as businesses (even if this perception does not necessarily always hold in urban or congested conditions). Alternatives have to be available and attractive in order for people to choose it.

City logistics is one of the measure packages where local action and agreement is particularly important. Not many cities have yet adopted a proactive approach – like planned in Valanov – where the different actors (retailers, forwarders, carriers and the municipality) form a partnership that works together to identify and deliver solutions. Moreover, because a lot of the issues caused in the surrounding areas – as a result of through-traffic – support and buy-in for positive change is required and can be achieved through collaboration with the national and even European transport networks to relieve some of the burden on local roads.

6.3.5 External factors

As already mentioned, **legislation** that is conducive to the implementation of Valanov's plans is a critical precondition. Measures such as congestion charging, access restrictions zones, parking charges, and possibly preferential treatment of 'green' vans, trucks and cars within various programmes clearly require a stable legal framework. In some countries, the appropriate legislation for one or more of these areas is in place, but that is far from being the case everywhere. Even if certain measures are legally permissible, the government may decide, for example, that charging revenues are to be spent in other areas of the public budget or will be used to lower general taxes, so the city will not necessarily have leverage to implement its own strategy as intended. Valanov however is able to secure and influence part of the revenue stream for urban transport investments, including the cycling infrastructure projects.

Another, more general aspect is the availability of funds for investments in alternative modes and subsidies for various incentive schemes. To turn an urban transport system into a truly attractive alternative to individually-owned cars typically requires large sums that are beyond what a city budget can sustain. Even with some income from congestion charging or tolls, other funding sources such as national government support or private sources are necessary. In some countries, governments provide transfers to cities that adopt particularly visionary or effective sustainable urban mobility plans or schemes. This was obtained by Valanov, as it takes up its role as a so called "following city" – learning from the frontrunner cities it partners with elsewhere in Europe. Funding from the European structural funds or loans from the EIB are available on similar conditions for some cities.

7 Key messages and action steps

This final chapter will provide a general roadmap from a European multilevel governance perspective, with action steps for "who is to do what by when in order to reach the urban mobility goal."

The roadmap is based on a summary of key messages drawn from TRANSFORuM's consultation of stakeholders representing different dimensions of urban mobility, different parts of Europe, and different levels of governance and decision making.

The significance of private actors – in particular in the logistics sector – in fulfilling the White Paper goal is well appreciated and acknowledged. The potential role of this actor group was discussed in the TRANSFORuM workshops and is well addressed in the fictive cities in chapter 6. This final roadmap, however, is clearly focused on the actions that can be taken by governmental organisation on the three relevant political levels here. Quite often, the processes and measures described in the roadmap intend to enable or catalyse actions of the private sector.

The Key messages follow below in section 7.1. The Action steps will be outlined in section 7.2.

7.1 Key messages

7.1.1 Transforming urban mobility requires an open approach

A European roadmap for how to halve the use of conventionally-fuelled vehicles in cities and provide for CO_2-free logistics in major urban centres by 2030 needs to adopt a broad and open approach since the processes of transformation that are required cannot be prescribed from above.

European urban areas are different and their transport systems are often intertwined with the history, culture, economy, and environment of individual cities and Member States. The impact of technological, behavioural, and market trends are difficult to predict and the associated possibilities for change will likely materialise in dissimilar ways across the continent.

While stakeholders in Europe are broadly aligned in their concerns for bringing more sustainable and resource efficient mobility solutions into cities, and generally supportive of the intentions behind the White Paper goal, there is no overall agreement on which

clean and efficient transport solutions are most appropriate to implement in which cities or areas at this point. It is clear that new types of technology, organisation and governance will require time and room for experimentation, evolution, and learning.

A roadmap even for the specific urban mobility goal stated in the White Paper must take into account these broader strategic conditions, and cannot presently assume the form of a European-wide 'deployment plan'.

7.1.2 European goals must be aligned with local visions and benefits

80% of Europeans will live in urban areas by 2020 and cities constitute the main arenas for realising the urban mobility goal. The active visions and goals of urban transport stakeholders, entrepreneurs, and decision makers are therefore needed to drive strategic transformations.

The overarching concerns for climate change and delivering fossil fuel independence at the European level must be clearly aligned with concerns and action-motivating factors at the urban level such as improving accessibility, mobility, quality of life, safety, and health of citizens and businesses. While offering a climate responsible approach for urban businesses, improved city logistics is for example not the main solution to reduce CO_2 emissions globally, whereas it is essential for creating more safe, efficient and viable cities. Fortunately there is a significant potential for correspondence between local and overarching goals, in as much as many low carbon transport solutions are also supportive of convenient, city-friendly and healthy urban transport. If the White Paper goal is to be fulfilled it, must first and foremost become associated with understandable and measureable benefits for a wide range of stakeholders in each city.

The adoption – and adaptation – of the European goal to local concerns, visions and solutions is an essential part of further action towards the goal.

7.1.3 Replacing vehicles and fuels is important but not sufficient

Current vehicle fleets and fuel systems create massive problems that need to be resolved at a faster pace than currently. R&D in vehicle engine, fuel, and storage technologies need to be enhanced and accelerated. It would however be a mistake to design a European roadmap according to a strategic formula like 'cities + electrification = sustainable mobility'"

Specific technological solutions such as electromobility are new and untested for most cities and still suffer from various limitations. In some Central and Eastern European countries there are hardly any EVs on the market and citizens have yet to see a dedicated charging point. In other cities knowledge and technology may be present on various non-conventionally-fuelled alternatives for both passenger and freight, but vehicles and systems remain expensive, impractical, or based on energy carriers that may be far from CO_2-free or sustainable.

Practically all stakeholders engaged in TRANSFORuM agreed that a roadmap for the urban mobility goal must therefore embrace a much wider scope of transport options than simply replacing conventionally-fuelled vehicles with non-conventionally-fuelled ones. Otherwise too many challenges would be left unsolved and too many synergies with regard to accessibility, mobility, congestion, safety and the attraction of inner cities would be left unexploited.

The most promising solutions may in fact be ones that combine new technologies with new mobility solutions such as sharing and partnering models for EVs, EFVs or bicycles. The roadmap should help tease out the new and yet unknown solutions and combinations.

7.1.4 Limiting conventionally-fuelled vehicle use can come at low costs

Investments needed for new technologies and infrastructures may seem like impediments for transformation of urban mobility systems, especially in times of economic contraction with limited funds available and weaker demand. In some cities renewal and change occur at a slower pace than was expected when the White Paper was adopted.

However, TRANSFORuM's review of possible building blocks for change as summarised in chapter 4 of this document has emphasised the promising potential of many less costly options for limiting the use of conventionally-fuelled vehicles. This includes for example

measures to enhance walking, cycling, e-bikes and car-sharing that are not yet widely exploited in many cities, as well as measures where up-front investments can lead to significant efficiency gains over time, such as the introduction of electric propulsion and efficient ticketing systems for public transport, and the deployment of ITS solutions in urban traffic and logistics management. Some options like the introduction of road and parking charging, or the revision of company car benefits and taxation schemes can even release economic resources to support investments in other attractive solutions. In city logistics there are examples of commercially viable models such as the 'Binnenstadt' concept of some Dutch cities that combine the use of clean distribution vehicles with the provision of additional logistics services, although large-scale solutions of this kind are still rare.

The cost of alternative measures and models is of course important but should rather be seen as challenges to be creatively explored and financed than as barriers for action.

7.1.5 Political momentum must be fostered in many cities

Looking across Europe a number of cities stand out as already advancing towards a more sustainable urban transport situation in various areas, but in many more cities essentially no significant steps towards the goal have been taken, and essentially no ambitions to do so are apparent.

The distinction between already advancing and not yet active cities is important even if there is currently no clear information available about how many cities would belong to each category. Especially the latter group needs to be transformed into what we optimistically call 'starters'. The broad set of building blocks presented in chapter 4 offer all cities different opportunities to make their transport systems more sustainable and efficient, some of which can be applied immediately, and the frameworks presented in chapter 5 describes mechanisms that can help promote, fund and govern a more transformative use of these building blocks to reach the goal.

However, stakeholders have repeatedly pointed out that the most fundamental impediments to start a transformation in many cities is often not a lack of solutions, planning skills, or resources but rather a missing culture for innovation and transformational governance, and a low degree of political momentum to foster such a culture. There is a strong need to identify ways to inspire cities to take action at the political level, for example by ensuring a mobilisation of a broad range of local stakeholders around urban transport transformational visions, and through the support of European-wide or global networks of decision makers agreeing to commit to sustainable urban mobility goals. A recent example of the latter is the Urban Electric Mobility Initiative (UEMI), launched at the Climate Summit in New York, in September 2014, urging city governments to ensure that EVs constitute 30% of the travel by 2030 (UEMI, 2014).

Partnerships for change at the political level are needed to embody the transformation of urban transport and logistics as a 'winner' case for cities, and to support underlying processes of analysis, planning, deliberation, and innovation.

7.1.6 National and state frameworks must support European goals and local actions

Even if cities are the main arena for transformation they cannot fulfil the goal without active support from initiatives at national, state and regional governmental levels, be they starters or more advanced ones.

There is a clear but differentiated need across Europe for both hard and soft infrastructures in areas such as planning regulations, taxation rules, investment support, ICT solutions, monitoring procedures, and capacity for experimentation, in addition to systems and standards for cleaner vehicles, fuels, infrastructures, and products. While technical standards for important elements such as charging equipment, and fuel efficiency are best defined at the European level, and governance arrangements for urban mobility must have a local basis, the benefits and even necessity of national/regional support in several areas should not be underestimated, even if stakeholders do not all agree about the role of central government. Cities advancing today – such as Oslo in terms of electromobility, Copenhagen in terms of cycling, and many other cities in terms of modernised public transport schemes – do so not least because of favourable background conditions supported by national tax incentives, legislation, investment support and R&D.

New actions at Member State and regional level are essential in areas such as deployment of alternative fuel infrastructure, rules on access restrictions and charging schemes, fiscal incentives, and national frameworks for planning to enhance SUMP.

7.1.7 Communication, coordination, and knowledge consolidation will advance the learning curve

The most widely shared observation emphasised among stakeholders is the strong need for continued communication, coordination and dialogue on sustainable urban transport solutions and transformations. A reinforced dialogue among stakeholders should be prioritised at all levels, and across them, because enhanced dialogue is the best way to move upwards on the learning curve.

Given the subsidiarity principle, action at the local political level is important to support innovations, initiatives and developments that are underway in a 'bottom-up' manner. City governments need to work as catalysts supporting local ideas and initiatives just as much as authorities exercising power. Particularly in the area of freight and logistics a need for a dialogue- and partnership-based approach has been pointed out, since private transport operators, urban consignees, and public authorities, can each only observe a limited part of the whole picture. National fora for dialogue and exploration such as DINALOG in Netherlands, the CLOSER arena in Sweden for logistics, and Mobi-E for electromobility in Portugal, are also important for defining country-specific frameworks and roadmaps.

It was confirmed in TRANSFORuM that a lack of data is a serious factor hampering progress, in the passenger, but in particular in the logistics sector. The European Commission has a key role to consolidate the knowledge base for European-wide dialogue and learning. The Commission should continue to support the development of frameworks and databases though research, monitoring and dialogue with stakeholders.

7.2 Action steps – who has to do what by when?

To reach the urban mobility goal of the White Paper coordinated actions must be taken by stakeholders at all levels of decision making over an extended period of time starting now.

The proposed roadmap of actions – who has to do what by when – is described in the following sections. The proposed actions are summarised in two main Tables, 6 and 7.

The action tables are structured in the following way:

- The ***vertical*** table dimension depicts the different policy levels of action (the 'who')
- The ***horizontal*** table dimension depicts the time towards the future (the 'when')
- The table ***cells and arrows*** depict the proposed ***actions*** (the 'what')

The three ***levels*** are the European, the national/regional, and the urban. 'Regional' here includes countries with a federal structure (e.g. the Länder in Germany). The distinctions are only indicative, as the roadmap of actions does not consider specific institutional arrangements in the Member States.

The two upper levels (EU and national/regional) are covered in sections 7.3 and 7.4 and in Table 6, while the urban level is addressed in section 7.5 and Table 7.

The ***time*** covers the span from now (2015) to 2030, when the goal is to be fulfilled. The timeline is for simplicity divided into three periods, each approximately five years long. This supports a distinction between actions to be taken now/in the near term (2015–20), in the mid-term (2020–25), and in the longer term (2025–30). It must be stressed that these divisions are indicative and qualitative.

The ***actions*** proposed are divided in two types, called ***'processes'*** and '***measures'*** respectively. This distinction draws on quality management for urban transport policy.[10] The processes concern communication and coordination actions, whereas the

10 See for example FGM-Amor (2013) Final ADVANCE Audit Schem and Guidelines. URL: eu-advance.eu

measures refer to more direct policy, regulation, intervention and investment actions. These types of actions are sometimes overlapping or connected in practice, so the distinction is not always clear cut.

The proposed actions mainly refer to such activities expected by ***policymakers*** and ***authorities*** at the different levels acting as convenors, catalysts, or regulators in regard to urban transport technologies, systems, markets and users. Actions to be undertaken by other stakeholders are not directly described in the roadmap, but their multiple contributions are essential, as will be clear.

Proposed ***milestones*** are inserted in both tables, and explained in Table 8. The milestones refer to combined results at the European level, and not to milestones for individual Member States of for individual cities, as were exemplified in chapter 6. The proposed milestones are examples that reflect important indicators of progress. The exact formulation and timing of milestones would have to take into account the final design of a roadmap.

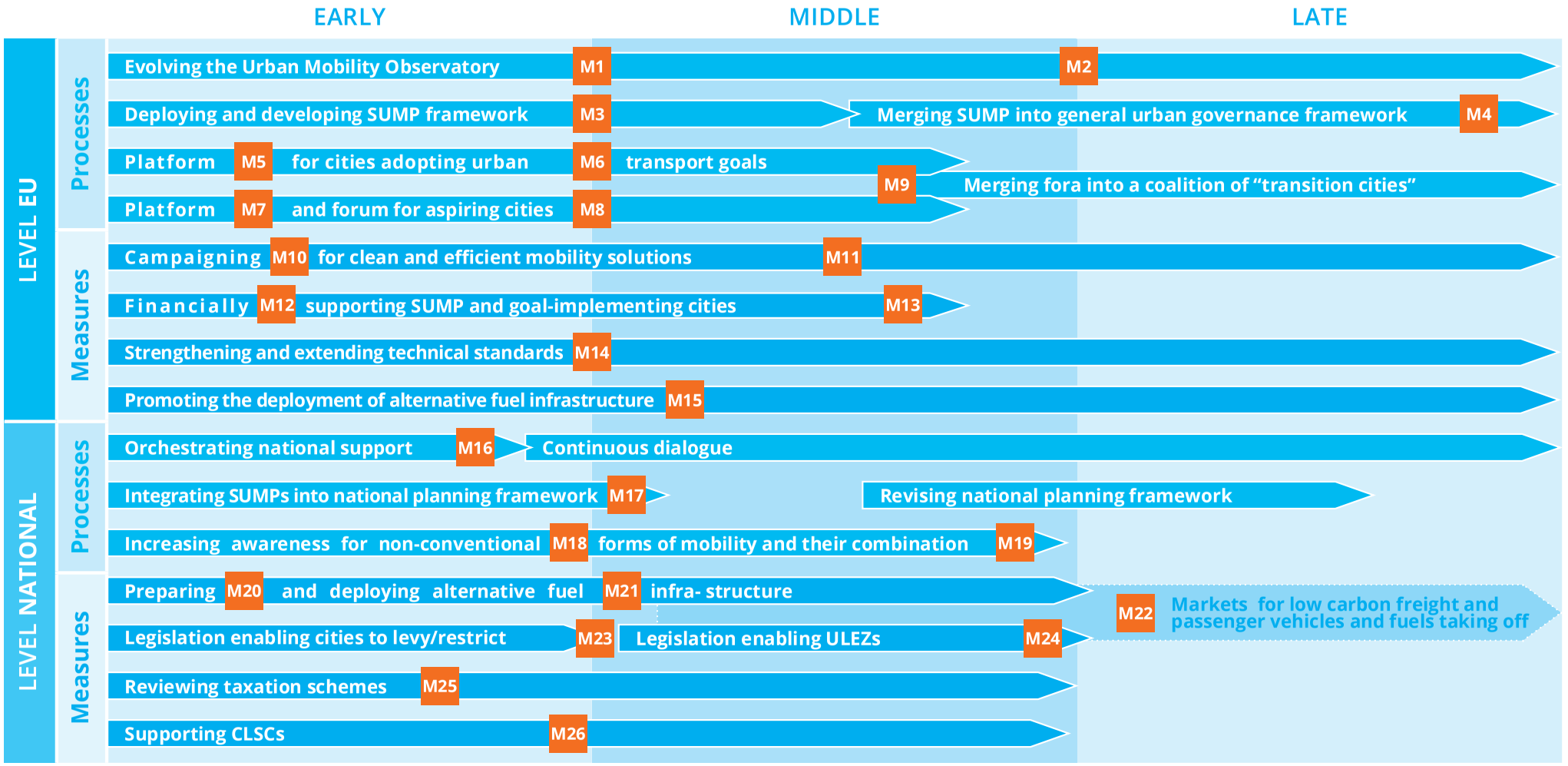
7.2.1 Action Tables and Milestones

No.	Milestones for the European and national levels
M1	Data, indicators and procedures to measure urban mobility goal performance resolved
M2	A comprehensive benchmarking system for clean and efficient urban transport defined
M3	Concept of SUMP recognised by all cities in Europe; 2nd generation SUMP framework adopted
M4	3rd generation SUMP integrated as part of wider urban development frameworks adopted
M5	European platform for cities committing to urban mobility goal formed with 20 Mayors
M6	100 Mayors have committed their cities to urban mobility goal
M7	A European platform for aspiring cities formed with 50 Mayors
M8	500 Mayors have joined the aspiring cities platform
M9	All European cities have committed to urban mobility goal; The platforms are merged
M10	Prestigious award for clean and efficient urban transport launched
M11	Survey demonstrates high awareness or European urban mobility goal and strategies
M12	Funding schemes adapted to support aspiring cities investing to reach urban mobility goal
M13	100 cities have received European support; All funding efficiently spent on relevant projects
M14	All relevant technical standards to support clean and efficient urban transport revised/proposed
M15	National programmes for promoting alternative fuels evaluated and new measures proposed
M16	All Member States have defined how to orchestrate national support for urban mobility goal
M17	All Member States have reviewed national planning frameworks to support SUMP
M18	All Central and Eastern European Member States have launched campaigns or similar
M19	85% of citizens in Central and Eastern European Member States express support to non-conventionally-fuelled vehicles
M20	All Member States have communicated convincing plans for deployment of alternative fuels
M21	All Member States have implemented effective plans for deployment of alternative fuels
M22	Efficient markets for affordable alternative fuels emerging in all Member States
M23	All Member States have reviewed legislation to allow cities necessary leverage over access
M24	All Member States have reviewed legislation to allow cities to restrict non-zero-emission access
M25	All Member States have reviewed taxation schemes
M26	All Member States have national programmes supporting CLSCs

No.	Milestones for the urban level
M27	All cities have conducted a stakeholder dialogue on urban mobility goal and strategies
M28	All cities have adopted a certified SUMP by 2020
M29	25% of cities have adopted a second generation certified SUMP by 2025
M30	Half of the major cities have established some form of freight transport partnership
M31	All major cities have established a freight transport partnership following 'good practice'
M32	Most cities have joined city networks for urban mobility goal (=M6 and M8)
M33	At least 50% of the cities are experimenting with or have implemented alternatively-fuelled buses
M34	At least 50% of cities committed to only use renewable energy for public transport
M35	At least 50% of cities have fully switched to renewable energy for public transport
M36	At least 50% of cities have MIMP system in place
M37	800 cities have adopted basic pedestrian and cycling networks and strategies, cycling in European cities increased on average 100% between 2015 and 2020, with minimal reduction in walking and public transport
M38	400 cities have extensive bike-sharing systems with e-bikes and/or large secured bicycle parking at public transport nodes; cycling in European cities has increased on average 200% between 2015 and 2025, with minimal reduction in walking and public transport
M39	Most cities provide support to car-sharing initiatives, and have adopted Mobility Management strategies jointly with employers and business parks
M40	At least 25% major cities (that have a legal basis to do so) have introduced road and/or extensive parking charging favouring non-conventionally-fuelled vehicles (according to a standard definition)
M41	At least 25% of major cities (that have a legal basis to do so) have introduced access restrictions favouring non-conventionally-fuelled vehicles (according to a standard definition)
M42	All major cities have introduced charging or access restrictions favouring non-conventionally-fuelled vehicles (according to a standard definition)
M43	In 40% of major cities one or more CLSCs have been established, based on a review of needs and opportunities in the particular context
M44	10% of urban freight is carried by ZEVs
M45	25% of urban freight is carried by ZEVs
M46	At least 75% of cities have adopted a procurement policy for alternatively-fuelled mobility
M47	All publicly procured mobility in European cities is zero emissions and based on renewables

Table 6: Milestone descriptions for urban mobility roadmaps

ACTION TABLES



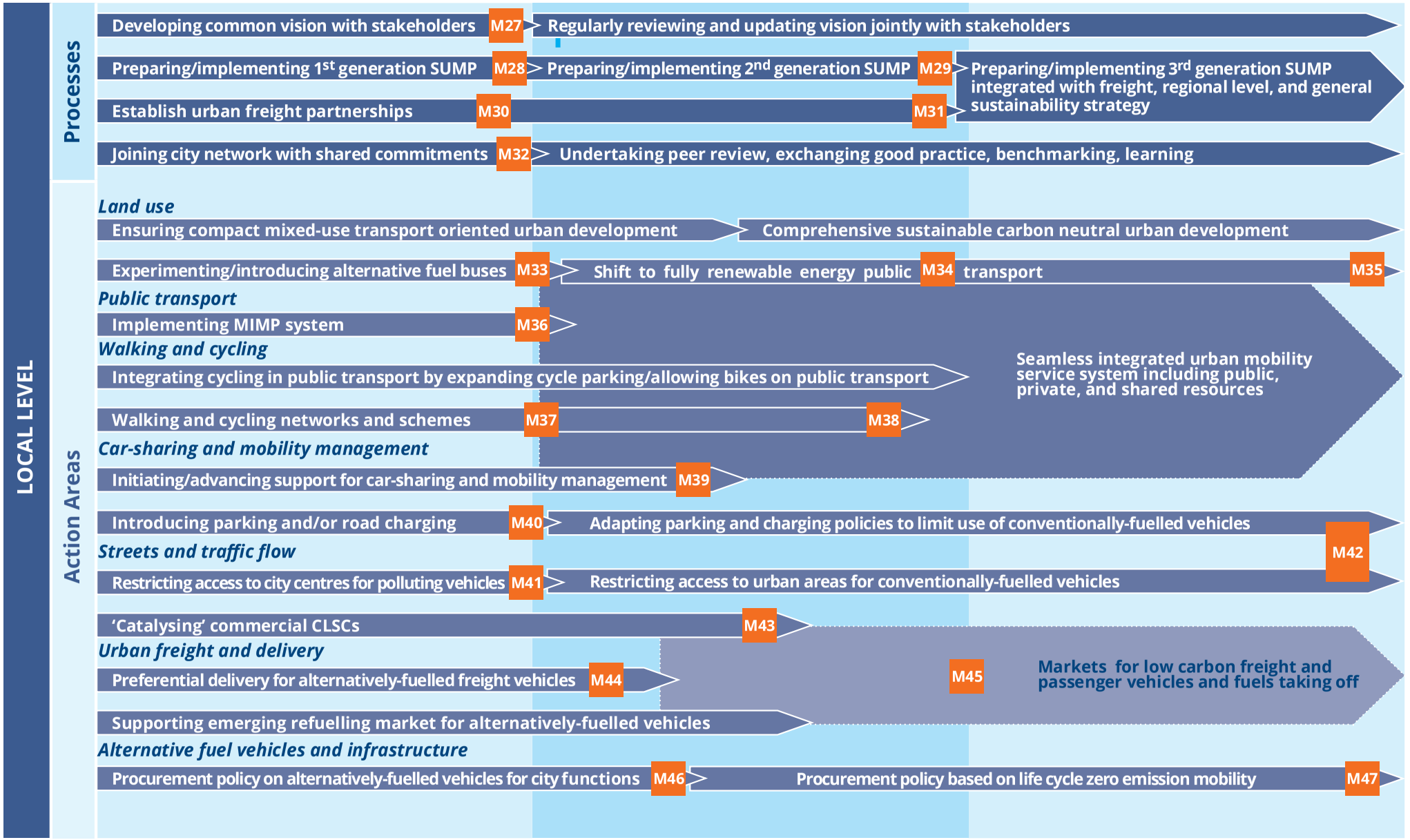


Table 7 and Table 8: Proposed processes and measures at the EU and national levels/Processes and actions at the urban level - key examples

7.3 European level

Action at the European level is especially relevant in order to set common technical standards for vehicles, fuels and refuelling systems, to define frameworks for common national and local actions, and to support research in common urban transport problems and solutions with a view to exchanging good practices, and monitoring performance and results across countries and cities in Europe. The following are the proposed key processes and actions at the European level.

7.3.1 Processes

1) Evolving the Urban Mobility Observatory (UMO)

The UMO function currently supported by the European Commission should be further evolved and enhanced as a knowledge co-production and co-utilisation platform involving stakeholders and knowledge institutions. Results from research and experiments on efficient, low cost, low carbon transport solutions across Europe should be collected, condensed and communicated. Progress towards urban mobility goal should be monitored with a view to scoring and benchmarking. Key assignments for the UMO should be to develop and apply measures of the use and share of non-conventionally fuelled vehicles at city level (not just ownership), as well as methods to map freight transport services and impacts in cities including accurate carbon emission calculations of supply chains. The observatory activities should be coordinated with other relevant urban, transport and environmental observatories and monitoring agencies.

2) Deploying and further developing the SUMP framework

The concept of SUMP should be continuously deployed, developed and enhanced as a basic framework for transport policy in European cities. Existing concepts and guidance should be reinforced in areas such as goal and target setting, roll-out of alternative fuel infrastructure, support for city logistics (as part of the SUMP, not as a separate activity), and evaluation and learning methods.[11] A SUMP certification or grading scheme should be established to facilitate the use of SUMPs for benchmarking and for regulatory or funding decisions. SUMP should also gradually be extended so at to apply to peri-urban areas and larger polycentric urban regions and SUMP should be integrated in broader urban sustainability governance frameworks such as the European Reference Framework for Sustainable Cities (RFSC) or the ISO standard ISO 37120 on the sustainable development of communities.

3) Enabling a political platform for sustainable urban mobility goals

A platform for political commitment to urban mobility goals should be facilitated at the European level. The commitment platform should include explicit reference to the White Paper goal, but should also take into account other relevant initiatives such as the Covenant of Mayors and UEMI. Whether the platform could be based in existing city networks or if it would be more effective to set up a new framework of cities committing specifically to a set of sustainable urban mobility goals should be agreed in a process of consultation involving the European Commission and city representatives in the early phase of the roadmap. Whatever the basis of the platform it should involve high-level policy meetings based on regular reporting on achieved progress, as well as joint actions and exchanges at the practical level.

4) Creating a dedicated platform for aspiring cities

A special platform should be established to engage 'starting' cities that have not yet embarked on transformations and who are not yet ready to commit to ambitious goals, but aim to empower themselves to do so. All starter cities could be offered training in SUMP, access to knowledge resources, and to join specific 'twinning' arrangements with an advancing city of choice, specifically to facilitate progress being made in this area. A milestone should be that all starter cities have adopted a SUMP and joined the network of committing cities before 2020, after which special platform could be terminated as no cities would be considered 'starters' any longer.

11 It should be mentioned here that some experts suggest a particular focus on sustainable urban logistic plans (SULP); in this document we understand urban logistics plans as being integrated into the SUMP concept

7.3.2 Measures

1) Strengthening and extending technical standards

European technical standards for vehicles, fuels and infrastructure should be continuously reinforced and extended to further limit emissions and fuel consumption, including CO_2 limits for heavy duty trucks and vans. The standards should be technology neutral and supported by clear labelling for consumers. Fuel efficiency test cycles should be made to reflect real consumption in urban driving. Sustainability criteria for fuels in the Renewable Energy Directive should be regularly updated to reflect the latest knowledge on environmental and climate effects including indirect land use change (ILUC) impacts. Green certificate-like models could be considered for EV-based mobility services if this could help promote low carbon mobility solutions. It could also be considered to introduce green standards or certification schemes for urban traffic management systems in regard to energy/CO_2 savings.

2) Promoting the deployment of alternative fuel infrastructure

Following the adoption of rules for the deployment of alternative refuelling points across Europe in 2014, Member States have until 2016 to detail their plans. The European Commission should closely monitor and review the effectiveness and cohesion of the national plans and subsequent implementation efforts, including the adequacy of information provided to consumers on alternative fuel availability. The Commission should also support research into the effectiveness and adequacy of different national plans, strategies and measures for deployment of alternative fuel infrastructure and the associated market responses, compared to other ways of limiting the use of non-conventionally-fuelled vehicles.

3) Financially supporting SUMP and goal implementation

European institutions (funds, banks, programmes) should continue and extend the financial and practical support offered to sustainable urban mobility initiatives in European cities, emphasising measures that would reduce the use of conventionally-fuelled vehicles. The future support levels could be conditioned on the cities' adoption of a SUMP, and possibly the level of commitment to urban mobility goals. Special support could be provided to starter cities that cannot yet adopt a comprehensive SUMP, but would commit to start preparing one. Funding for guidance and training on SUMPs should be extended to reflect the need to engage many more cities. A regulation, requiring cities to adopt SUMPs should be considered again on the medium-term timeframe.

4) Campaigning for clean and efficient mobility solutions

Current campaigns conducted by the European Commission like 'Mobility Week' and 'Do the right mix' should be maintained and reinforced with potentially higher rewards for cities adopting more innovative, ambitious mobility solutions. There could be a stronger emphasis on rewarding solutions, innovations and partnerships on the freight side where there is a growing need for sustainable solutions that are also economically viable. It could be considered to offer a special prize for the best city in the category of 'local transport' within the European Green Capital award scheme, to exploit the trendsetting prestige of this award. The general awareness about sustainable mobility problems, goals and solutions should be monitored.

7.4 National level

Urban planning frameworks and general transport policies as well as taxation and charging rules remain largely within national jurisdictions. The national level is especially important to align country specific legislation, fiscal regulations, and planning frameworks with transformations needed to accomplish European and local goals for urban transport systems, as will be outlined in the following.

7.4.1 Processes

1) Orchestrating national support for sustainable urban mobility goals

The chances to fulfil the White Paper or any other urban transport goals are strongly dependent on national policies and frameworks, and all Member States should therefore undertake a review of these

in the light of the emerging European agendas and the needs of their cities. Member States should consult their cities on their views on European goals and strategies, and the national support and implementation efforts. This will also help prepare the communication of national policy frameworks for the deployment of alternative fuels by 2016. Member States should also consider how they could support the European platforms for political commitment to urban mobility goals that were outlined in section 7.3.

2) Integrating SUMP in national planning laws and frameworks

National planning frameworks should be adapted so SUMPs or SUMP-equivalents become a required, or natural (as appropriate) element in urban transport planning. National initiatives such as training schemes, network formation, and benchmarking activities that could further support the adoption and implementation of SUMPs should be introduced. Member States should also consider how sustainable urban mobility is addressed in other urban planning and development frameworks, and undertake reviews to ensure mutual support.

Member States should make sure to include Mobility Management as an element in the national planning frameworks for cities, to ensure that cities seek to affect the demand for transport in connection with the development and operation of major urban activity centers (like shopping malls, cultural venues, sport stadiums, hospitals, and major workplaces).

3) Increasing awareness of public transport, cycling, car-sharing and their combination

Member States, not least in countries with weak traditions should deploy effective campaigns to promote awareness of alternative solutions to the use of conventionally-fuelled vehicles in cities, for example inspired by direct marketing approaches. In countries with advancing cities it would be particularly relevant to help raise awareness of possibilities for outperforming the use of conventionally-fuelled cars by combining various modes and technologies in providing near-seamless travel. Campaigns may be targeted to particular segments of the population, such as young adults before they acquire a drivers' license, or particular businesses such as company clusters engaged in Mobility Management schemes, or retailers and restaurants in city centres. Campaigns could be combined with more direct measure to incentivise shift in behaviour.

7.4.2 Measures

1) Preparing and deploying alternative fuel infrastructure and facilities

While some countries have adopted visions with indicative targets for the number of alternative fuel vehicles by certain years, EU Member States have jointly agreed to set goals and prepare national frameworks for the deployment of alternative energy supply and standardised supply interfaces before the end of 2016. The Directive instructs countries to provide for infrastructure for recharging EVs in urban areas by 2020, and measures for LNG, CNG, and (optionally) hydrogen by 2025, in addition to clear information to consumers. In adopting such goals and frameworks Member States need to develop ambitious, effective and realistic deployment strategies allowing markets for alternative fuels to mature quickly – including e.g. 'smart charging'[12] options– to mature. Targets and strategies should be regularly updated to accelerate progress towards a mature and diverse market for alternative fuels in all Member States by 2030.

2) Allowing cities to charge and restrict unsustainable vehicle traffic

Today some Member States allow cities to restrict access to the most polluting trucks and cars in order to meet air quality goals. In a few other countries cities are allowed to charge road users that enter or drive into (parts of) the city to limit congestion, sometime with exemption for low-emitting cars. In the UK, the Greater London Authority will introduce an ULEZ, that will support the Mayor's plans for making EVs, PHEVs and other alternatively-fuelled vehicles commonplace in London (Transport for London, 2014). However, several Member States have little or no legislation that allow such initiatives at city level. All Member States should undertake a review of what they could do to yield more leverage for cities to regulate the uptake and use of vehicles according to goals for sustainable and resource efficient urban transport, while taking into account European legislation, the associated costs for businesses and households, and the need for fair competition. Member States should encourage cities to undertake experiments and, if successful and

12 Smart charging options optimise the use of the electric grid and the available energy to minimise additional investment needs and to facilitate the integration of renewable energy

cost effective, to introduce permanent vehicle restrictions to support sustainable urban mobility goals. By 2020 all Member States should be able to present an analysis of the available options to increase leverage for cities and how they propose to release them, and at least some of them would be able to introduce legislation allowing cities to deploy ULEZ or zero emission zones, if deemed feasible and appropriate.

3) Reviewing taxation schemes (vehicle taxes, VAT, company car tax exemptions)

Taxation is a hugely effective instrument to incentivise and regulate the purchase and use of different types of cars and propulsion systems. Especially in countries like Norway and Denmark where vehicle taxation is high this has been demonstrated. Company car rules can also affect the number and types of cars that are acquired. Changes to taxation rules can however also have major impact on public revenues and the private economy, and 'green taxation' can even boost the sale and use of cars. All Member States should review their current taxation rules and schemes in order to identify ways in which revisions could be made to limit the use of conventionally-fuelled cars in cities, while taking into account all environmental, economic, fiscal and social impacts.

4) Supporting CLSC

CLSC is one of the promising methods to promote more sustainable urban freight in cities, especially if combining consolidation of freight with low emission vehicles and added services for the commercial users of the CLSCs. National governments should not necessarily operate or directly subsidise CLSCs on a permanent basis, but could provide support for instance by harmonising regulations of freight vehicles allowed to access to urban LEZs. Eventually the use of CLSCs could become a requirement for certain product or service types, for example publicly procured goods. Governments should support experiments with CLSCs for different types of supply chains, vehicles types, consolidation models, and urban areas, with accompanying research and evaluations. By 2020 there should be on-going experiments with CLSCs using alternatively-fuelled vehicles in major cities in all Member States. By 2025 there should be commercially successful CLSCs in operation in at least half of Europe's urban centres.

7.5 City level

The city level is important as the main locus for the transformations needed to reach the urban mobility goal. Options for urban and regional governments to contribute include the use of measures such as spatial planning, parking regulations, access restrictions, and provisions for public transport, walking, cycling and low carbon freight vehicles. However, as emphasised by TRANSFORuM stakeholders and illustrated extensively in this document, cities face highly diverse spatial conditions, transport needs, resource constraints, mobility cultures, and policy priorities when they seek to intervene in the transport system. It is obviously not feasible to define specific combinations of actions within detailed timeframes that all European cities should jointly follow. Prevailing diversity – and limited knowledge – does not even allow for categorising cities into standardised areas (like the three pathways exemplified in chapter 6), for which pre-designated 'packages' of actions could be prescribed.

The local processes and actions proposed for the city level in the following section refer to general areas that could arguably contribute the most to reach the urban mobility goal, and ones that all cities should therefore consider to exploit ***to some degree and in some form***, to become part of the transformations towards more sustainable urban mobility as envisaged in the White Paper and other European policy documents on urban transport. The specific actions and measures cannot be meaningfully prescribed in a European roadmap but only exemplified. Nevertheless it is necessary that cities do in fact take action in most or all of the proposed areas if the goal is to be fulfilled. What we term 'starter' cities should begin by adopting early or basic versions of each process and action, while cites already 'advancing' would build on existing results and adopt more ambitious and transformative developments of some of these processes and actions.

The logic of the timeline for the urban level is that basic frameworks and actions sometimes need to be taken before more advanced ones can be rolled out (for example, a basic cycling network is a prerequisite for maximizing the benefit of investing in advanced bike-sharing schemes), while some of the more advanced steps also depend on actions at the national and European levels described in sections 7.3 and 7.4. The number of cities mentioned in the milestones compares to the approximately 800 cities in Europe with centres larger than 50,000 inhabitants.

7.5.1 Processes

1) Bring stakeholders together

The basis for successful transformation at the city level is to bring local stakeholders together and engage them in dialogue and visioning processes. All relevant stakeholder groups should be invited, including businesses, transport operators, citizens, knowledge institutions, and others. A key element in the dialogue will be to address the European (and national) goals for urban transport and adapt them to local conditions, opportunities, and aspirations that would be mapped as part of an on-going policy and planning process.

2) Prepare, adopt, and extend SUMPs

All European cities should develop some form of SUMP to serve as platform for connecting political visions and goals, strategies, plans, measures, and evidence utilisation in a common approach. The basis will be European SUMP guidance and related national frameworks. The first generation SUMPs should be completed by all starter cities before 2020. Advancing cities would already develop next generation SUMPs in the early phase, gradually incorporating a wider scope and range of issues, areas, and innovations, connecting to broader plans for sustainable urban development, prosperity and quality of life.

3) Establish freight partnership

Most cities today address freight transport issues in a reactive way, if at all. Cities need to develop partnerships around urban freight deliveries that involve business and transport operators in joint efforts to analyse problems and develop solutions and strategies. A form of freight partnership or other collaboration should exist in all European cities by 2020. The partnerships should proactively look for ways to provide more efficient and less emission intensive logistic services and procedures, with viable business models to exploit them profitably.

4) Joint city commitments

Cities should join one or more platforms of European cities committing to specific urban transport goals, as appropriate. This should be led by advancing cities who could already today make well-informed ambitious commitments and who could join in benchmarking with peer cities. Starter cities could join and commit, with less stringent parameters for inclusion initially, and be twinned with suitable advancing cities. Eventually, as starter cities advance their experience and confidence and become ready for bold commitments. Eventually, the two groups would be merged, and new ones, distinguished by for example size, or strategic priorities, could be formed.

7.5.2 Action areas

1) Land use

All cities should adopt an integrated transport and land use plan, as appropriately defined in national planning frameworks. The planning should help identify opportunities for limiting the need for individual motorised transport through various land use measures including zoning and parking and to map out how different areas of the city or region should be served by different low carbon energy efficient modes of transport, as well as the distributed need for alternative fuel infrastructures.

2) Public transport

Public transport offers some of the best opportunities to reduce the dependence of conventionally-fuelled passenger cars, especially if it is served by dense networks of modern convenient vehicles operating through integrated ticketing and information systems, and well supported by land use measures and easy access by foot and bicycle. Conventionally-fuelled buses should gradually be replaced by alternatively-fuelled ones or rail based systems where appropriate and feasible, to maintain environmental advantage over individual cars. By 2025 public transport in all European cities should be based mostly on fossil free fuels.

3) Walking and cycling

The most environmentally sustainable alternatives to the conventionally-fuelled passenger car (and indeed to delivery of packages by vans) are walking and cycling. While not all European cities have equally bicycle-friendly topographies, every city should have a basic walking and cycling network in place. On such as basis more advanced plans and strategies can be deployed, such as pedestrianised areas, bike-sharing systems including e-bikes and large scale bicycle parking facilities. Cycling facilities and systems should be well connected to the public transport network and eventually integrated in a future comprehensive mobility service system of a city encompassing elements such as public transport, shared cars and bikes, taxis, and informal ride-sharing. Cycling also has a potential in freight and parcel distribution, especially in inner city areas.

4) Car-sharing & mobility management

Car-sharing offers promising potentials for reducing the use of conventionally-fuelled passenger cars, directly through eliminating the need for cars, and indirectly if EVs are incorporated in shared car fleets. The latter is seen in some European cities today where car-sharing works as a business model for introducing EVs to consumers and vice versa (Beltramello, 2012). Usually car-sharing is financed and managed by private organisations. Cities can support car-sharing, e.g. by analysing the potential demand, providing reserved parking, promoting it, and procuring mobility services from car-sharing organisations. While car-sharing is today mostly seen in a number of advancing cities, all cities including starters, and smaller ones should develop a car-sharing strategy.

Mobility Management strategies should be promoted in all cities in order to affect the demand for transport in connection with the development and operation of major urban activity centers (like shopping malls, cultural venues, sport stadiums, hospitals, and major workplaces). Mobility Management measures are best incorporated already at the phase of location, design, and development of major urban activity centers, but can also be adapted to existing facilities and locations. Cities should promote mobility management strategies, reaching out to major workplaces and facilities to ensure they integrate sustainable mobility solutions in their location decisions, corporate plans, and employee relations. In more advanced stages shared cars and mobility management initiatives would become part of a comprehensive integrated mobility service system for a city region.

5) Street design and traffic flows

Ownership and control of the street network provides urban authorities with their most direct and potentially effective opportunity to influence the use of vehicles in cities. Access restrictions can reserve certain parts of the street network for non-conventionally-fuelled vehicles, depending on available national legislation. In more advanced versions cities could be envisaged to adopt ULEZs. Charging for the use of the road network or for parking are other means to regulate the transport flows and the composition of the vehicles that are used on the street networks, again depending on national frameworks and regulations.

6) Urban freight and delivery

Cities could adopt a number of strategies and measures to support more efficient and climate-friendly logistics. One possibility is to encourage and support private CLSC initiatives, while another is to designate decoupling points for parcel deliveries, but the actions that are relevant and viable need to be identified and explored in each city through the establishment of freight delivery partnerships. Experience from numerous on-going European projects and partnerships should be reviewed in each city as inspiration for local action.

7) Alternatively-fuelled vehicles and infrastructure

Cities should support the deployment of infrastructure for alternative fuels in accordance with national strategies and plans that are yet to be defined in most countries. Measures that can be exploited include provision for fuelling and charging systems away from home, transport advantages, such as waiving of parking fees or road user charging, and preferential treatment in the access to street networks, lanes, parking facilities etc. Cities can either be the organiser or just the catalyser for such measures. Charging infrastructures are often set up by private utilities. Cities can also adopt procurement policies in areas such as waste collection, public transport service and health services that favour mobility services and deliveries based on alternative fuels and clean solutions. Eventually more advanced procurement strategies with a view to zero emission mobility considering the full lifecycle of products and services could be adopted.

7.6 Conclusion

The proposed actions represent recommendations for decision makers and other stakeholders at the European, national and urban level with milestones proposed for all levels. If the actions are well coordinated and implemented in practice this should enable clear progress towards the urban mobility goal. It is however beyond the scope of this roadmap to identify the precise combination of processes and actions that would deliver the goal in the optimal way across European Member States and cities. The proposed roadmap should be further scrutinised, debated and enhanced in the coming months and years.

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A word on the independence, credibility and relevance of TRANSFORuM's results

Goals raise expectations and attract criticism but without them, we could only stumble into the future. So TRANSFORuM's starting point was to take the goals as formulated in the European Commission's White Paper on Transport (2011) seriously. A second constitutive principle of TRANSFORuM was to listen to those whose job it is to implement these goals, that is, all kinds of stakeholders in the European transport arena. Because transformation requires, by definition, innovative ideas, products, policies, services and new actors we made sure that the stakeholders we consulted included the entire spectrum from incumbent market players to emerging niche creators. For the same purpose, our workshops were held under the Chatham House rules and their minutes as well as list of attendees are available to the public on our website.

At times, these two principles (loyalty to the White Paper goals and a stakeholder-driven approach) got into conflict when stakeholders questioned the sensibility, operationalisation or feasibility of certain White Paper goals. We consider this in itself a worthwhile finding and as such this is recorded at appropriate points in the Roadmaps. On such occasions, the TRANSFORuM team felt called upon as a neutral broker to think about possible amendments of the goals to ensure that they are more widely accepted and therefore more likely to be implemented. A similar phenomenon occurred where stakeholders highlighted that certain aspects of a White Paper goal are already outdated, for example, due to technical developments since 2011. It is worth emphasising in this context that the perceived appropriateness of these goals varied across the four thematic areas pursued by TRANSFORuM.

In other words, we had to find a balance between our loyalty to the White Paper goals and to the principle of a stakeholder-driven process. An ideological dominance of either of them would not have led to a coherent set of policy packages. To put it bluntly: TRANSFORuM is not a frictionless communication channel of stakeholders' wish lists to the European Commission. Neither is it the Commission's unconditional servant. Instead, TRANSFORuM used the strength of its members' scientific calibre and independence in the process. Our results are therefore "based on" stakeholders' views but essentially TRANSFORuM's. There is, however, a slight "division of labour" across TRANSFORuM's different outputs.

For the **Roadmaps**, we tended not to question the White Paper goals as such. They are designed to be implementation-oriented, focusing on actors, budgets, time horizons, etc. TRANSFORuM has released

"A wish is a dream until you write it down. Then it's a goal!"
(Anonymous)

four Roadmaps, corresponding to its four thematic areas: Urban mobility, long-distance freight, high-speed rail and multimodal travel information, management and payment systems.

The **Recommendations** are also contained in a separate document, covering all four thematic areas in combination. They highlight proposed actions by all relevant actors and show how coordinated action can be more than the sum of isolated efforts.

The **Strategic Outlook** will be released in January 2015 and is essentially a sensitivity analysis to assess the robustness of the current Roadmaps and recommendations against the inevitable insecurity of long-term trends beyond the year 2030.

We hope this suite of products is not only useful to practitioners, stakeholders and policy-makers but also of particular value for the forthcoming review of the Transport White Paper. And even if not every page abounds with radically new ideas, the added value of TRANSFORuM is still:

- A new robustness and independence of the suggested prioritisations;
- A cross-disciplinary and cross-sectoral consolidation of what has been done in silos before;
- A fresh approach, based on a balanced chorus of voices, including incumbent and new actors;
- A refreshing sensitivity to the national and cultural differences across Europe;
- A rare legitimacy and credibility of our conclusions based on the transparency of the entire process;
- A first-ever attempt to build a Roadmap specifically towards the Transport White Paper goals;
- A holistic view, manifest in suites of suggested measures in the form of "policy packages";
- An encouraging and transferability-aware good practice collection across four White Paper themes;
- A novel and thorough participatory process with stakeholder-backing throughout.

Ralf Brand
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List of Deliverables

TRANSFORuM's final results are primarily based on the views of stakeholders we consulted through various means, in particular through a series of 10 face-to-face workshops. In the spirit of complete transparency and credibility we made the essence of these events available online at www.transforum-project.eu/resources/library.html.

Our conclusions also build upon a dovetailed set of background research and genuine analysis, which was condensed into a number of Deliverables we produced along the way. These are:

D2.1: "Shaping the TRANSFORuM Network". This document spells out the criteria that guided the selection of stakeholders to TRANSFORuM events;

D3.1: "Summary on main policies, funding mechanisms, actors and trends";

D4.1: "Challenges and barriers for a sustainable transport system – A state of the art report";

D4.2: "Challenges and barriers for a sustainable transport system – exploring the potential to enact change";

D5.1: "Good Practice Repository - Transformation is possible!";

D5.2: "Good practice in the context of delivering the White Paper";

D7.1: "Communication and Outreach Strategy". This document defined TRANSFORuM´s target audience and the best means and channels of communication with them.

These documents are also available at www.transforum-project.eu/resources/library.html

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